RECLAMATION INVESTIGATION AND EVALUATION REPORT
SPRING MEADOW LAKE SITE, HELENA, MONTANA

CONTENTS

Section			Page
5.0	RECLAMATION INVESTIGATION		5-1
5.1	INTRODUCTION		5-1
5.2	FIELD ACTIVITIES		5-2
	5.2.1	Solid-Matrix Sampling	5-4
	5.2.2	Surface Water and Groundwater Sampling	5-6
5.3	SITE AND WASTE CHARACTERIZATION		5-7
	5.3.1	Spring Meadow Lake – East Arm Area Soils	5-7
	5.3.2	Spring Meadow Lake – East Arm Sediments	5-11
	5.3.3	Spring Meadow Lake – Biological Sampling	5-13
	5.3.4	Spring Meadow Lake – Montana Wildlife Center Area	5-13
	5.3.5	Background Soil	5-17
	5.3.6	Surface Water	5-17
	5.3.7	Groundwater	5-21
5.4	RECLAMATION AND LAND USE CHARACTERIZATION		5-23
	5.4.1	Particle Size Analysis	5-23
	5.4.2	Cation Exchange Capacity	5-24
	5.4.3	Agronomic Analysis	5-25
5.5	HUMAN HEALTH RISK ASSESSMENT		5-26
	5.5.1	Hazard Identification	5-27
	5.5.2	Exposure Assessment	5-28
	5.5.3	Toxicity Assessment	5-29
	5.5.4	Risk Characterization	5-34
	5.5.5	Risk-Based Cleanup Goals	5-39
	5.5.6	Risk Characterization Summary	5-40
5.6	ECOLOGICAL RISK ASSESSMENT		5-42
	5.6.1	Contaminants and Receptors of Concern	5-43
	5.6.2	Exposure Assessment	5-46
	5.6.3	Ecological Effects Assessment	5-49
	5.6.4	Risk Characterization and Summary	5-50
5.7	SUMMARY AND CONCLUSIONS		5-53
	5.7.1	East Arm Area	5-54
	5.7.2	Montana Wildlife Center	5-55

CONTENTS (Continued)

Section **Page**

5.8 REFERENCES CITED 5-56

Appendices

5-A FIELD LOGBOOK
5-B RECLAMATION INVESTIGATION ANALYTICAL DATA
5-C RISK ASSESSMENT SPREADSHEETS AND DATA

TABLES

Table **Page**

5-1 SAMPLE COLLECTION AND ANALYSIS INFORMATION SUMMARY 5-3

5-2 SOLID MATRIX METAL CONCENTRATIONS – EAST ARM SURFACE AND SUBSURFACE SOILS 5-9

5-3 METAL CONCENTRATIONS IN SOLID MATRIX – EAST ARM SEDIMENTS 5-12

5-4 METAL CONCENTRATIONS IN BIOLOGICAL (AQUATIC INVERTEBRATES AND FISH) EAST ARM AREA 5-14

5-5 METAL CONCENTRATIONS IN SOLID MATRIX – MONTANA WILDLIFE CENTER AREA 5-16

5-6 BACKGROUND METALS CONCENTRATIONS IN SOIL 5-18

5-7 METAL CONCENTRATIONS IN SURFACE WATER 5-19

5-8 SURFACE WATER – STANDARD WATER QUALITY RESULTS 5-20

5-9 METAL CONCENTRATIONS IN GROUNDWATER AND WATER QUALITY PARAMETERS 5-22

5-10 PARTICLE SIZE ANALYSIS 5-24

5-11 CATION EXCHANGE CAPACITY (CEC) 5-25

5-12 AGRONOMIC ANALYSIS 5-26

5-13 EXPOSURE POINT CONCENTRATIONS 5-29

TABLES (Continued)

Table		Page
5-14	RISK VALUES FOR ARSENIC IN SOIL	5-36
5-15	RISK VALUES FOR LEAD IN SOIL	5-38
5-16	SUMMARY OF UNCERTAINTIES FOR RISK ASSESSMENT	5-38
5-17	RECREATIONAL RISK-BASED CLEANUP GOALS	5-40
5-18	SUMMARY OF TOLERABLE AND PHYTOTOXIC SOIL CONCENTRATIONS	5-40
5-19	MAMMALIAN TOXICOLOGICAL DATA FOR INORGANIC METALS	5-41
5-20	MONTANA SURFACE WATER QUALITY – AQUATIC LIFE STANDARDS	5-51
5-21	ECOLOGICAL IMPACT QUOTIENTS	5-51

FIGURE

Figure		
5-1	REMEDIAL INVESTIGATION SAMPLE LOCATION MAP	

5.0 RECLAMATION INVESTIGATION

The Montana Department of Environmental Quality-Mine Waste Cleanup Bureau (DEQ/MWCB) has requested that Tetra Tech EM Inc. conduct a reclamation investigation (RI) for the Spring Meadow Lake site. The RI delineates the nature and extent of mine wastes at the site, estimates risks these wastes may pose to human health and the environment, and presents data pertinent to potential reclamation. The RI field activities were described in Section 4, which was provided earlier under separate cover. This Section 5 will ultimately be part of a complete RI and expanded engineering evaluation and cost analysis (EEE/CA) report that will be compiled when this task order is complete.

5.1 INTRODUCTION

The first industrial use of the Spring Meadow Lake site dates to 1892, when the Stedman Foundry and Manufacturing Company opened a foundry. Workers erected three stone buildings to house the complex and a variety of iron products were produced, presumably for local use. The business closed because of insufficient funds in 1901. The Western Improved Wire Fence Company of the United States of America was the next site occupant, in 1906, but its tenure was also short lived and it abandoned the site by 1910.

The Northwestern Metals Company acquired the Stedman Foundry property in 1910 and installed a mill to process ore from its Comet, Bullion, and Crystal mine group in the Cataract Creek drainage basin south of Wickes, Montana. The 100-ton capacity mill employed the Baker-Burwell process, which used chlorine gas to react with the metals in the ore (dry chlorination) to convert the metals into metallic chlorides. The process was reported to work well on ores with high zinc content. Because of processing inefficiencies, however, the operation went into bankruptcy in 1915.

The New York – Montana Testing and Engineering Company formed in about 1916 and took over the Stedman Foundry property. With both testing and milling equipment, the company handled gold-silver and manganese ores. It received manganese shipments from the Ophir Mine in Butte and unnamed mines in Philipsburg, as well as material from the Valley Forge dumps near Rimini and possibly the Liverpool Mine in the Clancy district. An estimated 13,500 tons of manganese ore from Butte and Philipsburg plus 9,000 tons of local sulphide ore were probably processed at the Spring Meadow Lake site (RTI 2005). In 1918, New York-Montana Testing and Engineering acquired the 40-acre parcel north of the Foundry property from the Great Northern Railway. Although this information was not confirmed, the need for additional land for its tailings dump likely prompted the purchase (RTI 2005). Tailings from the

concentrator were dumped nearby, flushed with water, and allowed to flow across the ground, and may have encroached into the area (RTI 2005). This endeavor also was unsuccessful in the long term and closed in 1920.

The facility presumably stood vacant for several years until 1928, when George F. Jacoby acquired the foundry property (RTI 2005). Jacoby and his partner, Thomas Brownlow, using the name Helena Sand and Gravel, acquired adjacent properties in the 1930s and 1940s and opened a gravel pit north of the old foundry and mill complex. They stored and repaired equipment in the stone buildings, two of which still stand today. The sand and gravel operation expanded to include a ready-mix plant and remained in operation at the site until the late 1950s. Helena Sand and Gravel may have removed and relocated some mill tailings deposited on the site from the New York-Montana Testing and Engineering Company operations.

Since 1960, the Stedman Foundry property and associated excavated gravel pit have been used as a gravel pit operation, a headquarters for a construction business, and for land speculation. Montana Fish, Wildlife, and Parks (FWP) first acquired land in the Spring Meadow Lake Park area in 1981.

5.2 FIELD ACTIVITIES

The RI field activities were conducted on April 11 through 12, 2005, and on April 18, 19, and 21, 2005. The field activities at the Spring Meadow Lake site included collecting surface and subsurface solid matrix samples, sediment samples, and surface water samples, and drilling, installing, and developing two groundwater monitoring wells. The number of samples and the analytical suite are summarized in Table 5-1. The RI data collection was needed to (1) conduct a risk assessment, (2) complete an EEE/CA (to be documented in Section 6), and (3) select a preferred reclamation alternative. The information required to support the risk assessment, as described in the reclamation work plan (see Section 4), includes:

- Determining the magnitude and extent of potential surface and subsurface soil contamination
- Determining the magnitude and extent of potential sediment contamination
- Determining the magnitude of potential surface water contamination
- Determining the magnitude of potential groundwater contamination with the new monitoring wells

TABLE 5-1

SAMPLE COLLECTION AND ANALYSIS INFORMATION SUMMARY
SPRING MEADOW LAKE SITE

Sample Type	Number of Samples Collected	TAL Metals[a]	Particle Size	Cation Exchange Capacity	Agronomic Analysis[b]	Total Organic Carbon	Water Quality Parameters[c]
Surface soil	12	12					
Subsurface soil	34	34	7	7	7		
Sediment	8	8	0	0	0	8	
Surface water	3	3					3
Groundwater	2	2					2

Notes:
[a] Target analyte list (TAL) metals include antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc.
[b] Agronomic analysis includes pH, conductivity, N-P-K-, organic matter, and lime and fertilizer recommendations.
[c] Water quality analysis includes pH, conductivity, hardness, chloride, and sulfate.

The following evaluations were also performed to support the detailed analysis of reclamation alternatives of the Spring Meadow Lake site (Section 6):

- Develop accurate estimates of the area and volume of solid waste materials requiring removal and reclamation
- Determine the extent of previous removal activities associated with the historical sand and gravel mining at this site
- Determine revegetation requirements for disturbed areas, including liming requirements, solid matrix texture and grain size, fertilizer requirements, percent organic matter, and identification of native plant species
- Identify potential repository sites

The following samples were collected at the Spring Meadow Lake site: (1) solid-matrix samples, including soils collected from the surface and from backhoe pits; (2) surface water and sediment samples from Spring Meadow Lake; and (3) groundwater from two locations. Table 5-1 presents the total number and type of solid-matrix (soils and sediment samples) and water (surface and groundwater) collected and analyzed for the Spring Meadow Lake site. All samples collected during the RI were analyzed using an off-site laboratory. Figure 5-1 provides the location of all samples collected during this RI.

The RI field sampling activities are discussed below for the solid-matrix, surface water, and groundwater sampling efforts. Additional detailed information on the specific field sampling procedures used for this RI is described in the Spring Meadow Lake reclamation work plan (Section 4 of this report), which contains the field sampling plan.

5.2.1 Solid-Matrix Sampling

The solid-matrix sample locations were selected to provide spatial and discrete sample data to best characterize the nature and extent of the known (visible) and unknown (buried) mineral processing wastes across the Spring Meadow Lake site. Figure 5-1 shows the sample locations on both the Spring Meadow Lake and the Montana Wildlife Center areas. The focus for the RI solid matrix sampling was to delineate the extent of elevated metal concentrations in soil associated with the historical mill operations at this site. Surface and subsurface soil samples were collected, particularly in areas that were assumed to be affected by the historical custom mill operations, during the initial Abandoned Hard Rock Mine Priority Site Investigation and Hazardous Materials Inventory (Montana DEQ 2004). After the results of the site

investigation had been evaluated, it was confirmed that levels of arsenic, copper, manganese, lead, and zinc were elevated in areas of soil.

Surface and subsurface soil samples were collected during this RI to help define and estimate the volume of soils with metals above the preliminary remediation goals (PRG). The soil samples from the test pits were collected from the sides of the pits or from the backhoe bucket, depending on the depth of the pit. The solid-matrix samples from the test pits were collected from both within the visually observed mill waste materials, as well as from the soil horizon immediately below the wastes. The deeper soil samples were collected from the uppermost buried soil horizons, where applicable.

Only near-shore sediments were collected (at a water depth of 6 inches) during the initial site investigation. Additional sediment samples were collected during this RI throughout the east arm and representative shallow water areas of Spring Meadow Lake. The sediment samples were collected in areas where the water was 2 to 4 feet deep using a Ponar dredge sampler. On June 24, 2005, MWCB and FWP personnel collected additional sediment samples with collocated biotic samples at the Spring Meadow Lake site. These samples were collected to further characterize potential impacts to biotic and aquatic resources from the metal-contaminated tailings deposited near the east arm shoreline (see Figure 5-1). Three additional sediment samples were collected with a soil auger by coring sediments from a 0- to 4-inch depth. Three biotic (dragonflies) samples were collected in the same general locations of the east arm to better assess the potential for impact to the site's biotic and aquatic organisms. Samples were analyzed at an off-site laboratory for 11 total metals.

Physical descriptions of the solid matrix soil and sediment sample locations and the sampled media were recorded in a field logbook. A photocopy of the project field logbook is contained in Appendix 5-A.

In total, 54 solid matrix (46 soil and eight sediment) samples were collected from the Spring Meadow Lake project area. All solid matrix samples were analyzed for 13 target analyte list (TAL) metals at an off-site laboratory using inductively coupled plasma (ICP) spectrometry. Reclamation objectives were met by collecting samples of the buried soil horizons in seven locations and analyzing the soils for particle size (texture), cation exchange capacity (CEC), pH, and agronomic parameters (nitrogen, phosphorus, potassium, and lime and fertilizer recommendations).

5.2.2 Surface Water and Groundwater Sampling

Surface water and groundwater sample locations at the Spring Meadow Lake site were selected to characterize potential impacts to water resources from the activities associated with the historical mill and processing plant (see Figure 5-1). Three surface water samples were collected in Spring Meadow Lake by immersing the sample container directly into the surface water. Separate bottles were collected for analysis of metals and for water quality parameters (pH, conductivity, hardness, chloride, and sulfate). All sample containers were triple rinsed with sample water before the final sample was collected. The surface water samples were sent to an off-site laboratory for analysis.

Two groundwater monitoring wells were drilled at the Spring Meadow Lake site on April 11 and 12, 2005. The wells were drilled using an air-rotary percussion drill rig contracted from O'Keefe Drilling of Butte, Montana. One monitoring well was installed along the southeastern shore of Spring Meadow Lake, and the other well was installed north of the historical mill building in the Montana Wildlife Center. Soil and rock samples were not collected when the monitoring wells were installed because only a small volume of cuttings were generated during drilling.

The monitoring wells were developed on April 21, 2005, using a submersible pump and a multi-parameter water quality probe to establish that field parameters (pH, temperature, conductivity, dissolved oxygen, and oxidation reduction potential [ORP]) had stabilized. Between 12 and 15 gallons of water were pumped from each well before samples were collected. Monitoring well number 1 (MW-01) was drilled to a total depth of 32.55 feet below ground surface (bgs); the water table was measured at about 23 feet bgs on April 21, 2005. MW-02 was completed to a total depth of 29.9 feet bgs; the water table was measured at about 13 feet bgs on April 21, 2005.

The groundwater monitoring wells were sampled on April 21, 2005, immediately after the wells were developed. Groundwater samples were sent to an off-site laboratory for basic water quality tests (pH, electrical conductivity), anions (chloride and sulfate), cation (calcium and magnesium), and water hardness. The concentrations of dissolved metals and other water quality results for groundwater will be used to support selection of the preferred reclamation alternatives for this site.

5.3 SITE AND WASTE CHARACTERIZATION

This section describes the characteristics and analytical results for the solid matrix samples (soils and sediments), surface water samples (Spring Meadow Lake), and groundwater samples (from two monitoring wells) collected for the Spring Meadow Lake RI. Included in this section is information on the various mill waste types, the locations and approximate volumes, and other physical properties of the wastes. Characterization of the waste types is used to assess (1) the potential risk to human health and the environment, and (2) the specific waste material volumes associated with the reclamation alternatives for this site.

Complete analytical results and laboratory reports for all samples are in Appendix 5-B. The analytical data presented in this section are compared with cleanup levels residential, on-site workers, and recreational scenarios based on the conceptual site models for those specific areas of the Spring Meadow Lake property. The recreational-user and site-worker risk scenarios were merged for this screening level risk assessment, and the most conservative cleanup level from either group was used for arsenic and lead. The risk-based cleanup levels and methodology are described in detail in Section 5.5 (Human Health Risk Assessment) and 5.6 (Ecological Risk Assessment).

5.3.1 Spring Meadow Lake – East Arm Area Soils

The east arm at the Spring Meadow Lake site is an open area that includes a recreational walking path that surrounds Spring Meadow Lake. Most of this area is undeveloped park land that was disturbed and used during the previous sand and gravel mining operations. The remnants of various sand and gravel stockpiles are evident, and up to 2 feet of sand remains on the surface in some places. The far northern end (nearest Country Club Lane) was not as disturbed as was the southern area of the site, where the main sand and gravel yard was located. Very little of the aboveground structures remains from the historical hardrock mill or from the sand and gravel operations. Some concrete holding bins for various sand and gravel products and the large concrete base to load railroad cars with sand and gravel are still on site.

The east arm of Spring Meadow Lake site is vegetated with native and introduced grasses, shrubs, and trees. Some nearly barren areas are intermixed with better vegetated area based, to some degree, on the texture and depth of materials that remain on the surface during past uses. Some dominant grasses include Western wheatgrass, thickspike wheatgrass, inland saltgrass, needle-and-thread grass, smooth brome grass, sheep fescue, and cheatgrass. Forbs and shrubs that occur across the site include yellow

sweetclover, fringed sagebrush, prairie sage, woods rose, and Western snowberry. The overstory trees include cottonwood, willow, and dogwood.

Nineteen test pits were completed with a backhoe (TP-151 through TP-169) during the RI of the east arm of the Spring Meadow Lake site. An additional 13 test pits were excavated during the initial site investigation; those data are reported in a previous document (DEQ/MWCB 2004). Figure 5-1 shows the locations of the 13 earlier site investigation test pits and the 19 test pits completed during the RI. To complement the site investigation data, the RI test pits were located to fill data gaps and better define the areal and vertical extent of metals contamination across this site.

A total of 32 non-sediment solid matrix samples were collected from the 19 test pits. Of the 32 solid matrix samples, 10 were collected from surface materials (0 to less than 8 inches bgs) and 22 were from subsurface materials (variable depths to 66 inches bgs). Table 5-2 presents the concentrations of metals in the samples of surface and subsurface material.

Arsenic and lead in some East Arm soil samples were at levels above the PRG for direct contact with industrial soils reported by the Region IX Environmental Protection Agency (EPA) (EPA 2002a). Arsenic was found to be the primary contaminant of concern, and any potential reclamation or remediation efforts that clean up arsenic-contaminated soils would also clean up areas contaminated by lead. Arsenic was above the PRG for direct contact with industrial soils in 15 of the 32 solid matrix samples. Concentrations of arsenic ranged from 21 milligrams per kilogram (mg/kg) (TP-168B) to 10,400 mg/kg (TP-167A). Samples with high arsenic levels (more than 400 mg/kg) were also found to have very high levels of manganese (22,800 to 122,000 mg/kg). The material found to contain high concentrations of both arsenic and manganese is believed to be a mill-tailings waste product from the concentrating and processing of the manganese ores by the New York-Montana Testing and Engineering in 1916 and 1917. Areas with high levels of arsenic and manganese can be visually identified by the monoculture of inland saltgrass (*Distichlis stricta*) and the dark, black, fine-grained granular material on the surface.

TABLE 5-2
SOLID MATRIX METAL CONCENTRATIONS
SPRING MEADOW LAKE SITE
EAST ARM SURFACE AND SUBSURFACE SOILS (mg/kg)

Sample #	Depth (in)	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
Industrial Soil PRGs		**410**	**260**	**67,000**	**450**	**450**	**41,000**	**100,000**	**750**	**19,000**	**0**	**20,000**	**5,100**	**100,000**
TP 151	0-6	< 5	219	112	2	12	29	18300	154	3750	< 0.5	6	< 5	356
TP 152	0-8	< 5	54	56	< 10	74	17	94400	140	2240	< 0.5	9	< 25	81
TP 153 A	0-6	< 5	**329**	102	3	26	45	33200	247	4620	< 0.5	8	< 5	345
TP 153 B	18-24	< 5	< 50	71	< 10	52	18	62500	89	1490	< 0.5	7	< 25	106
TP 154 A	8-18	22	**879**	264	8	31	144	25000	**998**	**41400**	0.5	8	14	1460
TP 154 B	60-66	< 5	44	31	< 2	10	15	14200	72	446	< 0.5	< 5	< 5	77
TP 155 A	0-4	17	**434**	289	5	33	126	20000	677	**41700**	< 0.5	6	12	1260
TP 155 B	18-24	< 5	37	80	< 2	16	24	21100	75	425	< 0.5	10	< 5	87
TP 156 A	10-12	< 5	101	85	< 2	11	35	17000	83	1070	< 0.5	8	< 5	116
TP 156 B	36-42	9	**624**	224	6	12	77	18000	572	5340	0.6	8	< 5	908
TP 157 A	4-6	< 5	180	149	3	11	37	16600	146	3030	< 0.5	10	< 5	530
TP 157 B	24-36	< 5	45	133	< 2	13	20	17700	37	292	< 0.5	9	< 5	62
TP 158 A	6-9	22	**1460**	422	17	35	218	15600	**1310**	**111000**	0.6	< 5	27	3380
TP 158 B	28-32	< 5	62	75	< 2	14	24	17600	76	1420	< 0.5	7	< 5	109
TP 159 A	4-6	15	**1290**	232	17	16	123	18000	**926**	**29100**	< 0.5	6	13	2260
TP 160 A	4-6	61	**5400**	465	41	28	377	24000	**3330**	**85500**	0.9	< 5	50	5730
TP 161 A	0-6	13	**804**	106	8	14	74	17400	614	12100	< 0.5	< 5	6	841
TP 162 A	0-2	7	126	150	2	16	61	18600	269	15000	< 0.5	< 5	< 5	603
TP 162 B	36-42	< 5	100	161	< 2	19	73	24500	115	1730	0.6	15	< 5	187

TABLE 5-2 (Continued)
SOLID MATRIX METAL CONCENTRATIONS
SPRING MEADOW LAKE SITE
EAST ARM SURFACE AND SUBSURFACE SOILS (mg/kg)

Sample #	Depth (in)	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
Industrial Soil PRGs		**410**	**260**	**67,000**	**450**	**450**	**41,000**	**100,000**	**750**	**19,000**	**0**	**20,000**	**5,100**	**100,000**
TP 163 A	0-6	< 5	172	155	< 2	11	113	19400	189	5220	< 0.5	10	< 5	274
TP 164 A	0-4	23	**754**	539	12	40	241	15200	**1220**	**122000**	0.5	< 5	30	2680
TP 164 B	16-24	6	**461**	196	8	17	104	29700	373	4230	< 0.5	12	< 5	1260
TP 165 A	4-6	6	**502**	136	4	18	66	22900	389	12200	< 0.5	6	< 5	566
TP 166 A	0-4	12	**570**	194	5	14	102	15800	**537**	**27900**	< 0.5	< 5	8	1130
TP 166 B	12-18	< 5	26	44	< 2	5	< 10	7840	20	347	< 0.5	< 5	< 5	36
TP 167 A	14-20	93	**10400**	494	13	18	265	22400	**6180**	**53200**	0.6	< 5	54	2490
TP 167 B	22-24	< 5	101	57	< 2	12	25	15600	82	1210	< 0.5	< 5	< 5	97
TP 168 A	2-6	< 5	37	50	< 2	11	19	15600	37	338	< 0.5	8	< 5	62
TP 168 B	18-24	< 5	21	58	< 2	8	12	13200	30	644	< 0.5	< 5	< 5	48
TP 168 C	26-60	< 5	110	123	< 2	13	49	21500	108	1030	< 0.5	10	< 5	136
TP 169 A	0-6	11	**781**	202	6	13	103	19100	**590**	**24700**	< 0.5	7	7	1050
TP 169 B	6-18	10	**609**	200	5	15	92	21300	**496**	**22800**	< 0.5	7	5	911

Notes:
Bold and highlighted values exceed preliminary remedial goals (PRGs) for industrial soils under direct contact exposure pathways (EPA 2002)
mg/kg Milligrams per kilogram

Lead was also found elevated above the 750 mg/kg PRG for direct contact with industrial soils in nine of the 32 solid matrix samples. Concentrations of lead ranged from 20 mg/kg (TP-166B) to 6,180 mg/kg (TP-167A). Lead is associated with the same mill-tailings wastes and was elevated only in samples that were also very high in arsenic (more than 260 mg/kg).

The source of the elevated concentrations of arsenic appears to be the mill-tailings waste product associated with the manganese concentrating and processing in 1916 and 1917. The dark black mill tailing was likely disposed of near the area where the east arm of the Spring Meadow Lake was later dug. Mill tailings were subsequently eroded and displaced by later sand and gravel operations.

5.3.2 Spring Meadow Lake – East Arm Sediments

The actual east arm of Spring Meadow Lake is a seasonally, to near permanently, ponded area with water depths varying from a few inches to about 6 feet deep. The east arm area was not mined for sand and gravel but was excavated to develop fish habitat (RTI 2005). The east arm has naturally revegetated and supports a healthy vegetation community and the recreational uses associated with the Spring Meadow Lake State Park.

Sediment samples were collected at eight locations in the east arm and southeastern portion of Spring Meadow Lake during the RI. A Ponar dredge sampler was used to collect sediment from the upper 2 inches of sediment at each location. Water depths were recorded and vary from about 2 feet (SD-201, SD-202, SD-205, and SD-208) to 6 feet (SD-206). The depths of water at the other sediment sample location were estimated at 3 feet (SD-204, SD-207) and 4 feet (SD-203). Ten near-shoreline sediment samples were collected from the site (SD-101 through SD-112; but not SD-104 or SD-105) during the initial site investigation. In June 2005, DEQ/MWCB and FWP collected three collocated sediment and aquatic insect samples. The aquatic insect sampling is described in Section 5.3.3 below. Analytical results for sediment from these three investigations are provided in Table 5-3. Figure 5-1 shows the locations for the 10 site investigation sediment samples, 8 RI sediment samples. The 3 collocated DEQ and FWP sediment samples are not shown on Figure 5-1, however these samples were collected in the same general area where samples SD 110, SD 201 and SD 202 were taken, indicating that sediment arsenic and lead levels are not uniform across the eastern arm area.

TABLE 5-3
METAL CONCENTRATIONS IN SOLID MATRIX
SPRING MEADOW LAKE SITE EAST ARM SEDIMENTS (mg/kg)

Sample #		Investigation	Depth (in)	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Hg	Ni	Ag	Zn
Sediment Goals				**2.9**	**19**		**7.5**				**240**	**0.16**	**39**		**500**
SD	201	RI	0-2	< 5	95	77	< 2	8	25	10800	135	< 0.5	< 5	< 5	198
SD	202	RI	0-2	< 5	34	54	< 2	7	19	9550	53	< 0.5	< 5	< 5	83
SD	203	RI	0-2	< 5	19	52	< 2	10	15	9840	64	< 0.5	< 5	< 5	82
SD	204	RI	0-2	< 5	32	116	< 2	10	42	9560	163	< 0.5	< 5	< 5	218
SD	205	RI	0-2	< 5	31	120	< 2	10	38	14300	130	< 0.5	7	< 5	185
SD	206	RI	0-2	< 5	20	98	< 2	6	24	6420	70	< 0.5	< 5	< 5	93
SD	207	RI	0-2	< 5	105	121	< 2	5	39	6940	70	< 0.5	< 5	< 5	314
SD	208	RI	0-2	< 5	110	130	6	13	78	14800	319	0.6	7	< 5	619
SD	101	SI	0-2	< 5	13	29	< 2	36	14	39200	48	< 0.1	6	< 5	78
SD	102	SI	0-2	< 5	10	39	< 2	57	16	47700	79	< 0.1	9	< 5	88
SD	103	SI	0-2	< 5	< 10	46	< 2	56	< 10	48900	31	< 0.1	7	< 5	38
SD	106	SI	0-2	< 5	< 10	27	< 2	25	< 10	26400	16	< 0.1	< 5	< 5	25
SD	107	SI	0-2	< 5	10	31	< 2	8	24	11200	14	< 0.1	< 5	< 5	25
SD	108	SI	0-2	< 5	< 10	40	< 2	17	33	18100	39	< 0.1	< 5	< 5	37
SD	109	SI	0-2	65	136	108	3	13	112	9070	105	0.2	5	< 5	310
SD	110	SI	0-2	27	2130	270	14	40	156	18700	1480	0.4	< 5	19	2280
SD	111	SI	0-2	< 5	12	42	< 2	16	15	16000	38	< 0.1	6	< 5	76
SD	112	SI	0-2	21	726	291	10	35	96	22200	1030	0.2	6	10	1150
SML	301SD	DEQ/FWP	0.4	< 5	15	36	< 2	6	13	7800	27	NA	NA	NA	46
SML	302SD	DEQ/FWP	0-4	< 5	50	55	< 2	14	20	16100	53	NA	NA	NA	88
SML	303SD	DEQ/FWP	0-4	< 5	17	41	< 2	6	15	8420	28	NA	NA	NA	47

Notes:
mg/kg Milligrams per kilogram
Bold and highlighted values exceed Washington State Freshwater Sediment Quality PAET Values (Washington State Dept. of Ecology 1997)
SD Sediment sample prefix
SI Site investigation sample
RI Reclamation investigation sample
DEQ/FWP DEQ and FWP sediment and aquatic insect sampling on June 24, 2005
< Less than the method detection limit

The contaminant of concern for the sediments in the east arm of Spring Meadow Lake is arsenic. Seven of the eight RI sediment samples contained arsenic above the Washington State Freshwater Sediment Quality Probable Apparent Effects Threshold (PAET) value (19 mg/kg) that Montana DEQ uses for screening sediment. Three of the eight arsenic values in sediment samples (SD-201, SD-207, and SD-208) appear to contain higher concentrations (95 to 110 mg/kg) than the other five (19 to 34 mg/kg). Results for three of the 10 initial site investigation sediment samples, and for one of the three DEQ and FWP sediment samples, also exceeded the screening level. Background levels for arsenic in sediment were not established for the Spring Meadow Lake site.

5.3.3 Spring Meadow Lake – Biological Sampling

The DEQ and FWP collect collocated sediment and aquatic insect samples in the east arm area of Spring Meadow Lake on June 24, 2005, to evaluate the potential biological uptake of arsenic and other metals from sediment. Three samples of dragonfly nymphs were collected with a net at locations shown on Figure 5-1. The insect samples were analyzed at an off-site laboratory for total metals. On July 29, 2005, FWP collected samples of bass (composite of five fish) and pumpkinseed (composite of five fish) and analyzed them for total arsenic at the State of Montana environmental laboratory. The results for the insect and fish samples are provided in Table 5-4 and show that arsenic levels do not exceed the screening levels for fish and aquatic invertebrates.

5.3.4 Spring Meadow Lake - Montana Wildlife Center Area

The Montana Wildlife Center area of the Spring Meadow Lake site was the original Stedman Foundry property that was also used as a custom mill for processing gold-silver and manganese ores and as the yard and facility area for the sand and gravel mining operation. One of the old stone and wooden buildings burned substantially in December 2003. The remaining stone walls and concrete floor were demolished and hauled off site in early 2004, and the area has been regraded and covered with gravel. The Montana Wildlife Center has built several new chain-link fenced pens and shelters for wildlife. The Montana Wildlife Center opened in March 2004 and is currently operating.

TABLE 5-4

METALS CONCENTRATIONS IN BIOLOGICAL (AQUATIC INVERTEBRATES AND FISH) SAMPLES SPRING MEADOW LAKE SITE –EAST ARM AREA (mg/kg)

ID	Sample #	Date Collected	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Tl	Zn
Aquatic Invertebrates Screening Level [a]				30 - 50									
Fish Screening Level [b]				1 - 3									
SML	301 BUGS	6/24/05	<0.4	0.6	2	0.07	< 0.6	4.4	1080	1	17	<0.1	12
SML	302 BUGS	6/24/05	<0.4	3.9	5.5	0.09	< 0.6	3.0	1820	6.2	303	<0.1	17
SML	303 BUGS	6/24/05	<0.4	2.6	3.3	<0.06	< 0.6	4.5	800	1	98	<0.1	14
SD	Bass	7/29/05	NA	0.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD	Pumpkinseed	7/29/05	NA	0.3	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
mg/kg Milligrams per kilogram
Highlighted values for arsenic screening values in aquatic invertebrates and fish:
[a] USDI, 1998. Guidelines for Interpretation of the Biological Effects of Selected Constituents in Biota, Water, and Sediment – Arsenic
[b] Gilderhus, 1966. Some Effects of Sublethal Concentrations of Sodium Arsenite on Bluegills and the Aquatic Environment.
Metals Sb=antimony; As=arsenic; Ba=barium; Cd=cadmium; Cr=chromium; Cu=copper; Fe=iron; Pb=lead; Mn=manganese; Tl=thallium; Zn=zinc
NA Not analyzed

The focus of the RI for the Montana Wildlife Center was to better define the nature and extent of subsurface contamination identified during the site investigation. Six backhoe test pits (TP-169 through TP-174) were excavated in areas of the Montana Wildlife Center that had not been previously characterized. Solid matrix samples were collected from 15 test pits dug with a backhoe during the initial site investigation (DEQ-MWCB 2004), revealing buried floatation mill tailings in at least one area near the east side of the burned building. The additional six RI test pits were located to further define the horizontal and vertical extent of the potentially contaminated surface and subsurface wastes. Surface soils around the remaining two buildings were adequately sampled and characterized during the site investigation; therefore, only two additional surface soil samples were collected during the RI. Figure 5-1 shows the locations for the 15 previous site investigation test pits and the six RI test pits. Table 5-5 presents the concentrations of metals in the RI samples for the Montana Wildlife Center.

Fourteen total solid matrix samples were collected in the Montana Wildlife Center during this RI. Twelve of the solid matrix samples were from subsurface materials (10 to 38 inches bgs) and two were surface material samples (0 to 9 inches bgs). The contaminants of concern were arsenic, lead, and mercury. In general, these contaminants are similar to those for the Spring Meadow Lake east arm but included some higher levels of cadmium, copper, and mercury that may be associated with the early foundry wastes, disposal of floatation tailings, and other mill process wastes associated with Northwestern Metals operations from 1910 to 1915.

For this RI, only three of the 14 solid matrix samples (TP-171A, TP-173A, and TP173B) contained any metals at concentrations above the PRGs for direct contact with industrial soil (Table 5-5). Concentrations of arsenic were above the PRG for industrial soil (260 mg/kg) in two of these three samples. Sample TP-173A contained lead at concentrations above the PRGs for industrial soil, but the arsenic level was at 158 mg/kg, below the PRG for arsenic in industrial soil. Arsenic values in the 14 solid matrix samples ranged from 43 mg/kg to 33,700 mg/kg.

Sample TP-171A contained mercury at a detectable concentration of 2.1 mg/kg, along with very high levels of arsenic (33,700 mg/kg), lead (16,300 mg/kg), and manganese (60,000 mg/kg). Sample TP-173B also contained high levels of arsenic (1,240 mg/kg), lead (3,010 mg/kg) and manganese (36,900 mg/kg). Visual characterization of this material revealed that it was black to orange- and brown-stained waste. .

TABLE 5-5
METALS CONCENTRATIONS IN SOLID MATRIX
SPRING MEADOW LAKE SITE
MONTANA WILDLIFE CENTER AREA (mg/kg)

Sample #	Depth (in)	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
Industrial Soil PRGs		**410**	**260**	**67,000**	**450**	**450**	**41,000**	**100,000**	**750**	**19,000**	**0**	**20,000**	**5,100**	**100,000**
TP 170 A	4-6	< 5	< 10	46	< 2	13	19	16300	18	340	< 0.5	7	< 5	52
TP 170 B	20-28	47	< 50	78	< 10	32	99	103000	567	952	< 0.5	22	< 25	78
TP 170 C	32-38	< 5	61	140	< 2	10	29	14900	60	444	< 0.5	7	< 5	83
TP 171 A	2-12	280	33700	581	78	17	1290	61200	16300	60000	2.1	< 5	106	5940
TP 171 B	12-20	< 5	59	98	< 10	21	46	71900	60	1260	< 0.5	17	< 25	92
TP 171 C	30-36	< 5	43	142	< 2	12	24	16400	31	305	< 0.5	9	< 5	53
TP 172 A	18-20	< 5	30	64	< 2	10	21	15000	52	333	< 0.5	6	< 5	76
TP 173 A	0-9	9	158	773	14	48	350	18000	1290	224000	< 0.5	< 5	31	3370
TP 173 B	10-20	21	1240	343	246	24	253	53100	3010	36900	0.7	11	15	48400
TP 173 C	22-24	< 5	54	172	< 2	10	22	15000	27	448	< 0.5	9	< 5	93
TP 174 A	0-8	< 5	76	180	4	17	53	19300	298	18000	< 0.5	9	< 5	1050
TP 174 B	14-16	< 5	65	79	< 2	11	24	17800	55	391	< 0.5	8	< 5	80
TP 174 C	18-20	< 5	11	79	< 2	10	65	32600	84	396	< 0.5	12	< 5	69
TP 174 D	30-32	< 5	39	127	< 2	13	22	18200	33	407	< 0.5	9	< 5	89

Notes:
mg/kg Milligrams per kilogram
Bold and highlighted values exceed preliminary remedial goals (PRGs) for industrial soils under direct contact exposure pathways (EPA 2002)
TP Test pit prefix
A Uppermost sample in test pit
B Second sample in test pit – below A
C Third sample in test pit – below A and B
D Lowest sample in test pit – below A, B, and C
< Less than the method detection limit reported

5.3.5 Background Soil

The Spring Meadow Lake site is located near the Tenmile Creek floodplain and is underlain by sands and gravels from mixed igneous, limestone, and sandstone formations that were deposited by glacial outwash during the Pleistocene age (USDA-NRCS 2003). The alluvium parent materials for the soils that developed at this site were influenced by historical Tenmile Creek channel locations and by local depositional areas. The pre-disturbed soil type mapped for the Spring Meadow Lake site is the Meadowcreek-Fairway complex, 0 to 2 percent slopes (USDA-NRCS 2003). This soil, if undisturbed, would have loam-textured upper horizons overlying more coarse sandy loam subsurface horizons. These soils are moderately deep (35 inches) grading to gravelly sand from 35 to 60 inches bgs.

Nearly the entire Spring Meadow Lake site has been disturbed by past mineral processing, sand and gravel mining, or more recent uses. Even in areas that were not excavated, waste materials and common earthen fill have been deposited. A confirmed undisturbed background soil was not identified during the site investigation or the RI. However, the upper material (a few inches to several feet) was disturbed but the soils at depth (highly variable) appeared to have developed in place at several locations. Samples from these buried native soils were collected primarily to establish and define the lower boundary for potential removal efforts. Because these buried soils were visually determined to be undisturbed buried soil horizons, their concentrations of metals can be used to estimate background levels of metals in soil. Background levels of metals in soil are needed to complete the ecological risk assessment (Section 5.6). Three soil samples (TP-154B, TP-155B, and TP-166B) were used to estimate background concentrations of metals and are shown in Table 5-6. The locations for these test pits are shown on Figure 5-1.

5.3.6 Surface Water

Three surface water samples were collected from Spring Meadow Lake during the RI. Figure 5-1 shows the surface water sampling locations. Sample SW-201 was collected from the center part of the east arm of Spring Meadow Lake. Sample SW-202 was collected from a central area of the main Spring Meadow Lake body. Sample SW-203 was collected from the southern end of the east arm. In addition to the three samples collected during the RI, 12 samples were collected during the initial site investigation and were reported in a previous document (DEQ-MWCB 2004). Analytical results for all 15 surface water samples are provided in Table 5-7.

TABLE 5-6

BACKGROUND METALS CONCENTRATIONS IN SOIL
SPRING MEADOW LAKE SITE (mg/kg)

Sample #	Depth (in)	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
TP 154 B	60-66	< 5	44	31	< 2	10	15	14200	72	446	< 0.5	< 5	< 5	77
TP 155 B	18-24	< 5	37	80	< 2	16	24	21100	75	425	< 0.5	10	< 5	87
TP 166 B	12-18	< 5	26	44	< 2	5	< 10	7840	20	347	< 0.5	< 5	< 5	36
Average values		**5**	**35.7**	**51.7**	**2**	**10.3**	**16.3**	**14380**	**55.7**	**406**	**0.5**	**6.7**	**5**	**66.7**

Notes:

mg/kg	Milligrams per kilogram
in.	Inches below ground surface
TP	Test pit prefix
B	Second sample collected in test pit – below A

TABLE 5-7

METALS CONCENTRATIONS (Total Recoverable and Dissolved) IN SURFACE WATER
SPRING MEADOW LAKE SITE (mg/L)

Sample #	SI or RI	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zinc
WQB-7 Values		**0.006**	**0.018**	**2.000**	**0.005**	**0.100**	**1.300**	**0.300**	**0.015**	**0.050**	**0.00005**	**0.100**	**0.100**	**2.000**
SW 201	RI-TM	< 0.003	0.012	0.029	< 0.0001	<0.001	< 0.001	0.02	< 0.003	< 0.005	< 0.0006	< 0.02	< 0.003	< 0.01
SW 202	RI-TM	< 0.003	0.012	0.037	< 0.0001	<0.001	< 0.001	0.02	< 0.003	0.011	< 0.0006	< 0.02	< 0.003	< 0.01
SW 203	RI-TM	< 0.003	0.032	0.009	< 0.0001	<0.001	0.001	0.06	< 0.003	0.051	< 0.0006	< 0.02	< 0.003	< 0.01
SW 201	RI-DM	< 0.003	0.012	0.030	< 0.0001	0.004	0.002	< 0.01	< 0.003	< 0.005	< 0.0006	< 0.02	< 0.003	< 0.01
SW 202	RI-DM	< 0.003	0.011	0.037	< 0.0001	0.005	0.006	< 0.01	< 0.003	< 0.005	< 0.0006	< 0.02	< 0.003	< 0.01
SW 203	RI-DM	< 0.003	0.030	0.012	< 0.0001	0.003	0.003	0.01	< 0.003	0.018	< 0.0006	< 0.02	< 0.003	< 0.01
SW 101	SI-TM	< 0.003	0.009	0.024	< 0.0001	<0.001	< 0.001	0.11	< 0.003	0.017	NA	< 0.02	< 0.0005	0.01
SW 102	SI-TM	< 0.003	0.017	0.023	< 0.0001	<0.001	< 0.001	0.05	< 0.003	0.007	NA	< 0.02	< 0.0005	0.01
SW 103	SI-TM	< 0.003	0.017	0.022	< 0.0001	<0.001	< 0.001	0.05	< 0.003	< 0.005	NA	< 0.02	< 0.0005	< 0.01
SW 104	SI-TM	< 0.003	0.017	0.029	< 0.0001	<0.001	< 0.001	0.16	< 0.003	0.01	NA	< 0.02	< 0.0005	< 0.01
SW 105	SI-TM	< 0.003	0.017	0.031	< 0.0001	<0.001	< 0.001	0.08	< 0.003	0.01	NA	< 0.02	< 0.0005	< 0.01
SW 106	SI-TM	< 0.003	0.016	0.031	< 0.0001	<0.001	< 0.001	0.06	< 0.003	0.007	NA	< 0.02	< 0.0005	< 0.01
SW 107	SI-TM	< 0.003	0.017	0.032	< 0.0001	<0.001	< 0.001	0.12	< 0.003	0.008	NA	< 0.02	< 0.0005	< 0.01
SW 108	SI-TM	< 0.003	0.017	0.030	< 0.0001	<0.001	< 0.001	0.03	< 0.003	0.009	NA	< 0.02	< 0.0005	< 0.01
SW 109	SI-TM	< 0.003	0.019	0.030	< 0.0001	<0.001	< 0.001	0.09	< 0.003	0.009	NA	< 0.02	< 0.0005	< 0.01
SW 110	SI-TM	< 0.003	0.240	0.015	< 0.0001	<0.001	0.001	0.14	< 0.003	0.38	NA	< 0.02	< 0.0005	< 0.01
SW 111	SI-TM	< 0.003	0.017	0.030	< 0.0001	<0.001	< 0.001	0.05	< 0.003	0.011	NA	< 0.02	< 0.0005	< 0.01
SW 112	SI-TM	< 0.003	0.020	0.025	< 0.0001	<0.001	0.001	0.21	0.005	0.066	NA	< 0.02	< 0.0005	0.02

Notes:

mg/L	Milligrams per liter
WQB-7	Montana Department of Environmental Quality, Numeric Water Quality Standards, Circular, January 2004
Bold and highlighted	values exceed Montana Numeric Water Quality Standards
SW	Surface water sample prefix
RI-TM	Reclamation Investigation samples – total recoverable metals analysis
RI-DM	Reclamation Investigation samples – dissolved metals analysis
SI-TM	Site Investigation samples – total metals analysis
<	Less than the Method Detection Limit reported
NA	Not analyzed

The surface water samples from Spring Meadow Lake were analyzed for both total and dissolved metals. Only the values for total metals are comparable to the DEQ water quality standards (DEQ 2004). The RI surface water samples were also analyzed for standard water quality parameters, including pH, electrical conductivity, chloride, sulfate, and hardness (as $CaCO_3$). The standard water quality parameters are provided in Table 5-8.

TABLE 5-8

SURFACE WATER – STANDARD WATER QUALITY RESULTS
SPRING MEADOW LAKE SITE

Sample	Location	pH (SU)	Electrical Conductivity (µmhos/cm)	Chloride (mg/L)	Sulfate (mg/L)	Hardness as $CaCO_3$ (mg/L)
SW-201	East Arm – Central area	8.9	366	15	44	128
SW-202	Spring Meadow Lake – Center	8.4	386	15	44	153
SW-203	East Arm – South end	9.2	278	13	36	102

Notes:
SU Standard units
µmhos/cm Micromhos per centimeter
mg/L Milligrams per liter

The results for surface water samples indicate that the water in the east arm of Spring Meadow Lake contains arsenic and manganese at concentrations above Montana's human health standards for surface water (0.018 milligrams per liter [mg/L] for arsenic and 0.05 mg/L for manganese). Surface water sample SW-110 contained arsenic at a concentration of 0.24 mg/L and manganese at a concentration of 0.38 mg/L. Sample SW-110 was collected in the far southern end of the east arm, where visible mill tailings have been deposited along the shoreline and washed into the seasonally submerged zone. Surface water sample SW-112 was collected along the eastern side of the east arm and also contained arsenic and manganese at concentrations above the human health standards. The arsenic level in sample SW-112 was 0.02 mg/L and the manganese level was 0.066 mg/L, both just above the standards. Samples SW-110 and SW-112 were collected with collocated sediment samples (SD-110 and SD-112) that contained elevated concentrations of arsenic (2,130 and 726 mg/kg), manganese (48,800 and 25,000 mg/kg), lead (1,480 and 1,030 mg/kg) and zinc (2,280 and 1,150 mg/kg). The surface water in the east arm (southern portion) of Spring Meadow Lake appears to be affected by the metals in the mine tailings that have been deposited along the shoreline.

5.3.7 Groundwater

Very little previous data were available about groundwater quality in the Spring Meadow Lake area. Two monitoring wells were strategically located to evaluate whether surface and subsurface contaminated materials were affecting groundwater. Monitoring well MW-1 is located on the flat bench downgradient (north) of the former Stedman Foundry and custom milling and processing buildings. This location was selected to monitor the quality of groundwater below and slightly downgradient of the Montana Wildlife Center. The gradient of groundwater below the Montana Wildlife Center is believed to be generally to the north, toward Spring Meadow Lake.

Monitoring well MW-2 was drilled along the eastern side of the east arm and was situated to evaluate any potential impacts from the contaminated surface materials on groundwater in that area. The general groundwater gradient in the east arm area is also mostly north, but may have a northwestern component.

Groundwater samples were collected from both monitoring wells on April 21, 2005, the first samples collected and analyzed from these wells. The water samples were analyzed for 13 dissolved metals and for general water quality parameters (pH, electrical conductivity, chloride, sulfate, and hardness). The groundwater results are shown in Table 5-9, and the monitoring well locations are shown on Figure 5-1.

The results indicate that shallow groundwater under the Montana Wildlife Center contains elevated levels of arsenic and manganese. The concentration of arsenic (0.029 mg/L) was above the Montana human health standard for groundwater of 0.02 mg/L. The concentration of manganese in the sample from well MW-01 (0.39 mg/L) was above the Montana standard (secondary maximum contaminant level of 0.05 mg/L), which is based on a manganese level that may interfere with specified uses. No other metals were elevated in the sample from well MW-01. The groundwater sample from well MW-02 contained detectable levels of arsenic and manganese, but no concentrations of the metals exceeded the water quality standards.

TABLE 5-9

METALS CONCENTRATIONS IN GROUNDWATER AND WATER QUALITY PARAMETERS
SPRING MEADOW LAKE SITE

Sample #	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zinc
Dissolved Metals Concentrations (mg/L)													
WQB-7	**0.006**	**0.020**	**2.000**	**0.0050**	**0.100**	**1.300**	**0.30[a]**	**0.015**	**0.050[a]**	**0.0020**	**0.10**	**0.100**	**2.00**
MW 1	< 0.003	**0.029**	0.041	0.0001	0.008	0.005	< 0.01	< 0.003	**0.390**	< 0.0006	< 0.02	< 0.003	< 0.01
MW 2	< 0.003	0.010	0.043	0.0004	0.008	0.002	< 0.01	< 0.003	0.007	< 0.0006	< 0.02	< 0.003	0.04
Standard Water Quality Parameters (units defined)													
	pH (S.U.)	EC (µmhos/cm)	Chloride (mg/L)	Sulfate (mg/L)	Hardness as $CaCO_3$ (mg/L)								
MW 1	7.6	587	23	84	267								
MW 2	7.5	615	25	70	271								

Notes:
mg/L Milligrams per liter
WQB-7 Montana Department of Environmental Quality, Numeric Water Quality Standards, Circular, January 2004
Bold and highlighted values exceed Montana Numeric Water Quality Standards for groundwater
MW Monitoring well sample prefix
S.U. Standard units
µmhos/cm Micromhos per centimeter

5.4 RECLAMATION AND LAND USE CHARACTERIZATION

Physical and agronomic (nutrient) characteristics of selected soils were evaluated to evaluate whether the soils could support reclamation plant communities and future land uses. Visual observations indicated that contaminated materials are restricted to the surface on portions of the site, and that at depth the soils are essentially undisturbed. The undisturbed buried soils may, however, lack physical or agronomic properties needed to maintain self-perpetuating plant communities after reclamation. The anticipated reuse of the Spring Meadow Lake east arm is recreational and may be used for future park expansion and development. The Montana Wildlife Center is in the conceptual design phase for development of expanded educational and wildlife rehabilitation efforts.

An area is available in the currently undeveloped eastern portion of the state park to handle a potential waste repository, and the physical characteristics of the site would not be a major constraint. The repository would need to extend above the existing land surface, however, because groundwater is shallow in this area. Some small quantities of borrow and fill materials may be obtained on site but would be limited by the shallow depth to groundwater and intended future land use. Potential onsite and offsite repositories will be evaluated in the Expanded Engineering Evaluation/ Cost Analysis for the site.

5.4.1 Particle Size Analysis

Particle size analysis is a measurement of the size distribution of individual particles in a solid-matrix sample. Particle size distribution is used to measure and evaluate soil texture, sedimentation and alluvial processes, structural and construction purposes, many basic soil science properties (shrink-swell, plasticity, and other properties), and to predict hydraulic properties such as water-holding capacity and unsaturated hydraulic conductivity. Several particle size classification systems are defined; the U.S. Department of Agriculture (USDA) classification system is one of the most common and is used in this RI report. The USDA classification system defines soil particles smaller than 2,000 micrometers (μm) or microns into three major size groups:

- Sands (less than 2,000 μm to 50 μm),
- Silts (less than 50 μm to 2 μm),
- Clays (less than 2 μm).

Particle size was analyzed in four samples from the Spring Meadow Lake site; the results are listed in Table 5-10. The laboratory report is in Appendix 5-B. Samples were collected from true pedological soil horizons that were buried by past site activities, or from the native alluvial materials.

TABLE 5-10

PARTICLE SIZE ANALYSIS
SPRING MEADOW LAKE SITE

Sample ID	Description	Depth (in)	Texture	Particle Size Distribution		
				% Sand	% Silt	% Clay
TP-156B	Buried Soil	36-42	Loam	51.1	31.2	17.5
TP-157B	Buried Soil	24-36	Loam	43.8	36.2	20.0
TP-167B	Buried Alluvium	22-24	Sand	88.8	8.7	2.5
TP-169B	Buried Soil	6-18	Sandy Loam	67.5	23.7	8.8

Samples TP-156B and TP-157B had loam soil textures, which is favorable for revegetation at this site. Sample TP-167B was collected from the buried in-place alluvium material near the east arm. This material was very coarse-textured (sand) and would require amending with finer-textured soil or organic matter before revegetation would be successful. Sample TP-169B was collected from buried sandy loam material that may have been partially mixed with or affected by mill processing wastes. This sample contained arsenic at a concentration of 609 mg/kg, indicating some metals added from leaching or mixing. The native alluvial gravels were at 4.5 to 5 feet bgs at this test pit location.

5.4.2 Cation Exchange Capacity

CEC is a measure of the quantity of readily exchangeable cations that can neutralize the negative charges in the materials or soil. Samples selected for CEC analysis were collected from true soil horizons that were buried by past site activities, or from the native alluvium. In general, soils with finer textures and higher percentages of clay will have more internal surface areas and higher CECs. The negative charges are derived primarily from isomorphous substitution within clay minerals and broken bonds at the mineral edges and surfaces. Isomorphic substitution creates a permanent charge and is independent of the pH. The mineral edge charge, however, is variable and depends on pH and other properties. CEC is useful for evaluating the potential concentrations of plant-available metals that are readily exchangeable in the plant-growth media and are potentially phytotoxic.

CEC was analyzed in seven soil samples from the Spring Meadow Lake site. The results are presented in Table 5-11; a copy of the laboratory report is in Appendix 5-B. The CECs of the four buried upper horizon soil samples (assumed to be buried topsoil materials) had higher CEC values that ranged from 21.5 to 11.9 meq/100g. The CECs of the three buried gravelly and disturbed soils had much lower CECs that ranged from 7.8 to 5.0 meq/100g.

TABLE 5-11

CATION EXCHANGE CAPACITY (CEC)
SPRING MEADOW LAKE SITE

Sample #	Description	Depth (in)	CEC (meq/100g)
TP-156B	Buried Soil	36-42	16.4
TP-157B	Buried Soil	24-36	11.9
TP-158B	Buried Gravelly Sand	28-32	5.6
TP-162B	Buried Soil	36-42	21.5
TP-164B	Buried Soil (disturbed)	16-24	18.3
TP-167B	Buried Alluvium	22-24	5.0
TP-169B	Buried Soil (disturbed)	6-18	7.8

Notes: meq/100g Milliequivalents per 100 grams of soil

The buried topsoil horizons at the Spring Meadow Lake site have moderately high CEC values that indicate they are suitable for revegetation. The low CECs for the buried alluvium and disturbed soil indicate that these materials will need to be covered with finer-textured coversoil or amended with organic matter before they can be revegetated.

5.4.3 Agronomic Analysis

Complete agronomic or agricultural analysis is used to evaluate the potential fertility and plant nutrient availability in the buried soils. Agronomic analysis includes pH; nitrate, phosphorous, potassium (N-P-K); and electrical conductivity (salt hazard). A fertilizer can be recommended from the data when the predicted future crop or pasture use is included. Agronomic analysis is helpful for assessing the potential for in situ revegetation and to estimate the amount of fertilizer and other amendments that may be needed.

The same seven samples analyzed for CEC were also submitted for the agronomic analysis. The results are provided in Table 5-12; the laboratory test results in Appendix 5-B. All soil samples were slightly to moderately alkaline (pH 7.5 to 8.1) and contained very low levels of N-P-K for soils. These soil samples

were from subsurface depths, and their level of fertility would not be expected to be high. Levels of electrical conductivity (EC) were low in six of the seven soil samples, which would be expected for relatively clean (not contaminated) coarse-textured soils. Sample TP-156B is moderately saline (4 to 8 millimhos per centimeter [mmhos/cm]), which indicates that it has been affected by additional salts that have leached from the contaminated materials above. The concentration of arsenic in sample TP-156B was 624 mg/kg, and the concentration of manganese was 5,340 mg/kg. This buried soil has likely accumulated metals and may not support a desirable plant community unless amendments are provided.

TABLE 5-12

AGRONOMIC ANALYSIS
SPRING MEADOW LAKE SITE

Sample #	Description	pH (SU)	Nitrate as N (mg/kg)	Phosphorous (mg/kg)	Potassium (mg/kg)	Electrical Conductivity (mmhos/cm)
TP-156B	Buried Soil	7.5	1.35	151	510	4.22
TP-157B	Buried Soil	7.8	1.78	<4	130	0.34
TP-158B	Buried Gravelly Sand	7.8	<1.5	<4	50	0.46
TP-162B	Buried Soil	7.9	1.37	9	260	0.77
TP-164B	Buried Soil (disturbed)	7.6	1.02	34	260	2.62
TP-167B	Buried Alluvium	8.1	0.39		60	0.31
TP-169B	Buried Soil (disturbed)	7.9	0.53	34	100	0.34

Notes:
TP Test pit sample prefix
SU Standard units
mq/kg Milligrams per kilogram
mmhos/cm Millimhos per centimeter

5.5 HUMAN HEALTH RISK ASSESSMENT

A screening-level human health risk assessment was conducted for the Spring Meadow Lake site as part of the RI performed in the spring of 2005. The risk assessment was conducted using current guidance set forth by EPA (1989a). The risk assessment has been updated in this RI to reflect refined land use areas and to include additional data gathered at the site. Risk assessment data and calculation spreadsheets are in Appendix 5-C.

The assessment involved five steps: (1) hazard identification; (2) exposure assessment; (3) toxicity assessment; (4) risk characterization; and (5) calculation of risk-based cleanup goals. The following sections discuss these five steps in greater detail.

5.5.1 Hazard Identification

Hazard identification establishes the contaminants of concern (COC) for the site. Each COC must meet four criteria established by EPA (1989a): (1) the constituent is present at the site; (2) the measured constituent concentrations must be significantly above background concentrations; (3) 20 percent of the measured constituent concentrations must be above the method detection limit; and (4) the analytical results for each constituent must meet the quality assurance/quality control (QA/QC) criteria established for the data set.

Forty-six solid matrix samples, 8 sediments, 3 surface waters, and 2 groundwater samples were collected and analyzed for 13 TAL metals during this Spring Meadow Lake RI. In addition, 20 solid matrix, 10 sediment, and 12 surface water samples were collected and analyzed for 12 TAL metals during the site investigation. All data on total metals from 66 solid matrix samples, 20 sediment samples, 15 surface water samples, and 2 groundwater samples meet the EPA criteria for use is assessing risk. All samples were analyzed at an off-site laboratory using EPA contract laboratory procedure (CLP) methods and procedures. An additional 84 surface and subsurface samples were analyzed with a field portable x-ray fluorescence (XRF) spectrometer during the initial site investigation (DEQ-MWCB 2004).

The contaminants of concern for this site that met the requirements for limits of detection and QA/QC and that pose the greatest risks to site users are arsenic and lead. The data were screened against the Region IX EPA industrial soil direct contact PRGs. Arsenic, lead, manganese, and mercury were detected in at least one sample at concentrations greater than the industrial PRG for direct contact with soil PRG. All other metals (antimony, barium, cadmium, chromium, copper, iron, nickel, silver, and zinc) were not detected at concentrations greater than the PRG for industrial soil.

Surface water samples were collected from the Spring Meadow Lake and the small pond during the site investigation and this RI. The samples were analyzed for the same 13 TAL metals plus water quality parameters at an off-site laboratory. Concentrations of metals in the surface water samples were similar to the metals and concentrations found in the collocated sediment samples and the mill waste materials on the nearby shorelines.

Groundwater samples were collected from two monitoring wells. The only constituents detected in the groundwater samples at concentrations greater than drinking water standards were arsenic and manganese.

5.5.2 Exposure Assessment

The exposure assessment identifies the human receptors who may be exposed, the exposure routes through which the receptors may come into contact with hazardous constituents, and the assumptions and data used to quantify the exposure. The main exposure scenarios developed for the Spring Meadow Lake site are:

- Spring Meadow Lake – east arm Area = recreational use
- Spring Meadow Lake – Montana Wildlife Center = on-site worker

The Spring Meadow Lake east arm is undeveloped open space that may be ultimately developed for higher recreational use. Certain areas of the Montana Wildlife Center are open to the public (recreational use), but the entire site is used by on site workers. The future development plans for the Montana Wildlife Center and for the undeveloped areas of Spring Meadow Lake are uncertain.

Risks to recreational receptors at the Spring Meadow Lake east arm were screened using standard risk assessment exposure scenarios for children and adult recreational users. This recreational user scenario was developed based on EPA risk assessment protocols with input from DEQ and the Montana FWP. Children and adults were evaluated separately. The exposure scenario parameters are listed in Section 5.5.4. The potential for recreational use at Spring Meadow Lake is considered high due because it is a state park located near Helena.

The concentration of arsenic ranged from 21 to 10,400 mg/kg, with a mean of 837 mg/kg and a 95th percentile upper confidence level (95% UCL) value of 1,413 mg/kg for the Spring Meadow Lake east arm. Lead concentrations in the east arm ranged from 20 to 6,180 mg/kg, with an average of 631 mg/kg and a 95% UCL value of 976 mg/kg. Thirty-two samples (10 surface and 22 subsurface soil samples) were used in the calculations. The 95% UCL value was used as the exposure point concentration for arsenic (1,413 mg/kg) and lead (976 mg/kg). The maximum concentrations of metals detected in the surface water samples were used as the exposure point concentrations for this screening-level risk assessment for surface water at the Spring Meadow Lake site. Table 5-13 presents the 95 % UCLs and

maximum total metal values in surface water used for the exposure point concentrations for the Spring Meadow Lake east arm.

The concentration of arsenic for the Montana Wildlife Center area ranged from 10 to 33,700 mg/kg, with a mean of 2,543 mg/kg and a 95% UCL value of 5,136 mg/kg. Concentrations of lead in the Montana Wildlife Center area ranged from 18 to 16,300 mg/kg, with an average of 1,563 mg/kg and a 95% UCL of 2,812 mg/kg. Fourteen samples (2 surface and 12 subsurface soil samples) were used in the calculations. The 95% UCL values used for the exposure point concentrations for the Montana Wildlife Center area are shown in Table 5-13.

TABLE 5-13

EXPOSURE POINT CONCENTRATIONS
SPRING MEADOW LAKE SITE

Site Area	Media	Arsenic	Lead
Spring Meadow Lake – East Arm Area Soils = 95% UCL Surface Water = Maximum concentration	Solid Matrix (mg/kg)	1,413	976
	Water (mg/L)	0.032	0.005 [a]
Montana Wildlife Center Soils = 95% UCL	Solid Matrix (mg/kg)	5,136	2,812

Notes:
95% UCL Upper 95th % confidence level
mg/kg Milligrams per kilogram
mg/L Milligrams per liter
[a] Sample concentration from the October 2003 site investigation

5.5.3 Toxicity Assessment

The toxicity assessment phase evaluates the potential for COCs to cause adverse carcinogenic or noncarcinogenic effects in exposed populations. The most hazardous COCs identified at the Spring Meadow Lake site are arsenic and lead. Manganese is found at high concentrations at Spring Meadow Lake but is not considered as hazardous as arsenic and lead at this site because manganese is usually toxic only from inhalation or ingestion of fumes and dusts, which are not a primary concern for recreational use exposure at Spring Meadow Lake. The following sections summarize the potential adverse effects and dose-response relationships for arsenic and lead. The other metals at the site do not pose a significant risk to potential human receptors and were, therefore, excluded.

Arsenic

Arsenic is the twentieth most abundant element in the earth's crust and is present in virtually all living organisms. Freshwater supplies contain up to 1.4 mg/L of arsenic in certain areas of the United States and Canada. Seafood can contain significant concentrations of arsenic, ranging from 2 mg/kg for freshwater fish to 22 mg/kg for lobsters, most of which is organically (protein) bound. The average adult dietary intake of arsenic is between 0.025 and 0.033 milligrams per kilogram per day (mg/kg/d). This amount is nearly twice the level EPA considers to produce adverse health effects in humans (that is, the lowest observed adverse effects level [LOAEL] = 0.17 mg/L or 0.014 mg/kg/d). The largest source of human exposure to arsenic is arsenical pesticides that account for 80 percent of the industrial consumption of arsenic worldwide. However, other principal uses of arsenic include the manufacture of pharmaceuticals, glass, ceramic products, and metallurgy (Agency for Toxic Substances and Disease Registry [ATSDR] 1993a).

The Montana DEQ Remediation Division recently promulgated a generic action level for arsenic in surface soil of 40 mg/kg (MDEQ 2005). Arsenic occurs naturally in Montana soils at levels above both generic and Montana-specific risk-based concentrations. DEQ gathered data from 209 samples collected from unaffected (native) soils across Montana and calculated the 95% UCL of the mean of the data. The level of 40 mg/kg was selected as the generic action level for arsenic in Montana surface soils.

Arsenic (and arsenic compounds), especially organic arsenicals, are readily absorbed into the body after inhalation, ingestion, or dermal contact. When ingested, soluble arsenic compounds, including solutions, are almost completely absorbed through the gastrointestinal tract. Conversely, insoluble arsenic compounds are poorly absorbed, if at all. An orally administered dose of arsenic is distributed rapidly to virtually all tissue compartments (probably bound to protein), with the highest concentrations subsequently detected in the muscle, followed by the liver, hair, nails, and kidney; excretion by the kidney is almost complete within 6 days and accounts for over 90 percent of the dose. In liver tissue, trivalent arsenic (As^{+3}) is converted by microsomal enzyme systems and excreted in urine as multiple metabolites, including dimethylarsenic acid (50 percent), methyl arsenic acid (14 percent), pentavalent arsenic (8 percent), and trivalent arsenic (8 percent). Organo-arsenic compounds like those typically found in crab meat and other types of seafood are excreted essentially unchanged (ATSDR 1993a).

These “detoxification” processes effectively increase the molecular weight and polarity of the metal complex, thereby enhancing the rate of excretion in aqueous urine (half-life [$t_{1/2}$] = 7 hours). Like lead, mercury, and other heavy metals, arsenic is readily incorporated in fingernails, toenails, bone, and hair, providing an additional means of assessing historical exposure (ATSDR 1993a).

Symptoms of acute arsenic exposure include vomiting and diarrhea caused by severe gastrointestinal distress and general vascular collapse. The estimated lethal doses for humans are 60 milligrams of trivalent arsenic (As^{+3}) and 250 milligrams of pentavalent arsenic (As^{+5}). The most frequently noted and characteristic effects of chronic arsenic toxicity in humans include skin lesions, peripheral vascular disease, cardiovascular abnormalities, and peripheral neuropathy. However, the most significant toxic effect of chronic or prolonged low-level exposure to arsenic is carcinogenicity, including increases in the incidence of respiratory and skin cancers. For example, repeated epidemiological studies have found an increased incidence of skin and respiratory tract tumors in people exposed to arsenic fumes and dusts. Some studies have also reported increased bladder cancers. One study of elderly males in villages with arsenic-tainted drinking water showed a dose- and time-dependent response curve, with skin cancer rates as high as 26 percent in males exposed to water containing more than 0.6 mg/L arsenic. However, results of ingestion studies with animals have been generally equivocal (ATSDR 1993a).

Most reports of chronic arsenic toxicity have been in occupational settings from workers exposed to fumes and dusts, causing local irritation of the mucous membranes of the eyes and nose. Chronic toxicity is best diagnosed by measurement of concentrations in the hair or urine. For example, concentrations of arsenic in hair of normal persons are typically less than 1 mg/kg (average 0.5), whereas concentrations in subjects of chronic poisoning are often between 1 and 5 mg/kg, and can range as high as 47 mg/kg (ATSDR 1993a).

Given its systemic distribution, arsenic is readily transported across the placenta to fetal tissues, but teratogenicity (birth defects) and other reproductive effects have not been reported in laboratory animals at low to moderate parental dosages. However, chromosomal aberrations have been documented in humans exposed to industrial sources of arsenic, and select arsenic compounds have been found to be mutagenic in both *in vivo* and *in vitro* studies (ATSDR 1993a).

Arsenic is a Class A (that is, known) human carcinogen. Its oral slope factor is listed in EPA’s Integrated Risk Information System (IRIS) substance file (last updated April 10, 1998), as 1.5 mg/kg/d. No dermal slope factor was available for arsenic when this report was written. However, a dermal slope factor of 20

times the oral slope factor has been derived and employed on the basis that 5 percent of an ingested dose is absorbed by the gastrointestinal tract (EPA 1989a). The oral reference dose (RfD) reported in IRIS (EPA 1998) for arsenic toxicity in humans is 0.0003 mg/kg/d based on a chronic exposure study that produced hyper-pigmentation, teratosis, and possible vascular complications. The confidence level reported for this oral RfD was "medium." Unfortunately, no direct RfD for arsenic is available for the inhalation or dermal exposure pathways. As above, a dermal RfD value equal to 5 percent of the oral RfD has been derived assuming that approximately 5 percent of the ingested arsenic will be absorbed by the gastrointestinal tract (EPA 1989a). No RfD was calculated for the inhalation pathway since there is no standard relationship between oral and inhalation RfDs for inorganic compounds (EPA 1989a). An uncertainty factor of three is deemed sufficient for the arsenic RfD to account for outlying groups or effects, including so-called "sensitive" individuals, potential reproductive impacts, and other toxicological data gaps (ATSDR 1993a).

Lead

Lead and inorganic lead compounds are found in a variety of commercial products and industrial materials, including paints, plastics, storage batteries, bearing alloys, insecticides, and ceramics. In addition, lead is found naturally occurring in western United States soil at an average concentration of about 17 mg/kg (Shacklette and Boerngen 1984).

Humans are in a state of positive lead balance from the day of birth, such that a relatively slow accumulation occurs until a total body burden of approximately 50 to 350 milligrams of lead exists by age 60. Normal adults have been shown to absorb approximately 5 percent of an oral dosage of various lead compounds, although absorption depends entirely on the individual and the nature of the lead compound in question. Research has shown that men typically have higher concentrations of lead in nearly all tissues than women, and further, that the developing fetus and adolescent children are the two most sensitive subpopulations (ATSDR 1993b).

More than 90 percent of absorbed lead is deposited in bone, primarily dense bone, with only minor amounts excreted in hair, nails, or urine. However, the average absorption of lead in children may be significantly higher than in adults (that is, as high as 50 percent). Inhalation studies have shown that about half the lead deposited in the alveoli of the lung is absorbed directly into the blood stream and that most of the dosage (90 to 95 percent) is subsequently deposited in skeletal bone, where the half-life is

estimated to be 7 to 10 years. Although the predominant elimination pathway for lead (and most heavy metals) is urine, the rate of urinary excretion is notably slow (ATSDR 1993b).

Lead has been shown to adversely affect many enzyme systems, but the overall health effects from lead exposure are typically related to elevated blood-lead concentrations that can result in a variety of toxicological effects, depending on the level of exposure. For example, the most noteworthy clinical indices of lead toxicity in humans are its effects on heme (blood) synthesis, resulting in erythrocyte anomalies, and imbalances of porphyrin, protoporphyrin, and aminolevulinic acid. Generally, a concentration of 40 micrograms per decaliter (μg/dL) is considered the normal upper limit for blood lead, 99 percent of which is typically contained within erythrocytes (ATSDR 1993b).

The general symptoms of chronic lead poisoning include gastrointestinal disturbances, anemia, insomnia, weight loss, motor weakness, muscle paralysis, and nephropathy. For example, blood-lead concentrations higher than 40 μg/dL have been associated with central nervous system and kidney damage, as well as pernicious anemia. Concentrations on this order have also been associated with reproductive effects, miscarriage in pregnant woman, and sterility in males. Blood concentrations of 30 μg/dL and higher have been associated with defects in Vitamin D metabolism and with learning deficits in exposed children (ATSDR 1993b).

The effects of lead exposure at blood concentrations of 20 μg/dL and lower are more difficult to define. Some studies have reported increased blood pressure in males, starting at blood concentrations of about 10 μg/dL. Low-level exposure to lead during early childhood can cause multiple effects, including impaired intellectual and neurobehavioral development. In fact, it appears that some of these effects, particularly changes in the levels of certain blood enzymes and impaired neurobehavioral development of children, may occur at blood-lead levels so low as to be essentially without a "threshold." Similar low-level exposures to lead during pregnancy have been shown to cause reduced birth weight and preterm births. This sensitivity to lead toxicity extends from the fetal stage to the cessation of growth after puberty. Studies of blood-lead concentrations in children of industrially exposed fathers revealed that as many as 42 percent of the children exhibited blood-lead concentrations greater than 30 μg/dL and more than 10 percent of the children exceeded 80 μg/dL as a result of lead carried home on contaminated clothing (ATSDR 1993b).

On the basis of bioassay results in rats and mice, EPA has classified lead as a Class B2 (that is, probable) human carcinogen. Controlled dosage studies in humans have produced renal tumors after dietary and subcutaneous exposures to soluble lead salts. However, dosages that typically induce cancer in humans are higher than are associated with other health effects of lead exposure, such as reproductive and developmental toxicity and increased blood pressure (ATSDR 1993b).

Unfortunately, no standard carcinogenic slope factors or RfDs are available for lead. Although the "uptake biokinetic" model is used to calculate the risk to children in a *residential* land-use scenario, the model cannot be used to calculate risks to adults or children in *recreational* exposure settings. A cancer slope factor or RfD must first be obtained or calculated to assess the recreational risks to the adult and child from lead. Using the uptake biokinetic model with standard residential assumptions, the maximum safe concentration of lead for noncancerous effects has been set at 400 mg/kg. Therefore, standard residential child exposure assumptions were combined with an exposure point concentration of 400 mg/kg to calculate oral and dermal RfDs. The RfD was then adjusted until the hazard quotient (HQ) was equal to 1.0. The dermal RfD was calculated to be 5 percent of the oral RfD assuming that approximately 5 percent of ingested lead is absorbed by the gastrointestinal tract (EPA 1989a). No RfD was calculated for inhalation since there is no standard relationship between inhalation and oral RfDs for inorganic compounds (EPA 1989a). Using these derivation methods, the oral RfD was set at 0.0026 mg/kg/d and the dermal RfD was calculated at 0.00013 mg/kg/d.

5.5.4 Risk Characterization

This section summarizes the results of the human health risk evaluation, which included a statistical analysis of data, an exposure assessment, a toxicity assessment, and a risk characterization. Based on current and potential future land use, children and adult recreational exposure scenarios and an on-site worker scenario were evaluated based on the reasonable maximum exposure (RME). The RME evaluation incorporates conservative exposure parameters, as described below. In addition, exposure point concentrations (EPCs) for the RME evaluation are the lesser of the maximum detected concentration or the 95% UCL. Cancer risks and noncancer hazard indices (His) are summarized in the following sections; supporting calculations for the risks and HIs are contained in the accompanying tables.

The estimated cancer risks for the recreational exposure scenarios are based on separate evaluations for children (weighted averages for children 0 to 18 years) and for adult receptors. The noncancer HI was calculated for both the child and adult recreational receptors (Appendix 5-C). The total HI estimated for the child receptor is greater than for the adult because the intake for children of each medium (such as soil) per unit body mass is higher (hence, noncancer HIs for a child resident are always higher than the noncancer HIs for an adult). The following sections describe the risk calculations and uncertainty associated with the risk calculations.

Risk Calculations

The carcinogenic and noncarcinogenic risks to potential human receptors from arsenic and lead in soil were evaluated for the Spring Meadow Lake site. Arsenic was evaluated using standard EPA risk assessment methodologies. Lead was evaluated using a LeadSpread approach because there is no reported allowable exposure for lead. Arsenic poses both carcinogenic and noncarcinogic risks, while lead is considered only in the noncarcinogic risk assessment. Tables that summarize the risk calculations are in Appendix 5-C. The exposure parameters for arsenic were derived from various EPA sources, as noted below. The child and adult recreational exposure scenarios were evaluated using the following exposure assumptions:

Recreational Child Exposure

- Exposure duration = 18 years (6 years for young child noncarcinogen)
- Exposure frequency = 20 days per year
- Body weight = 35 kilograms (weighted average); 15 for young child
- Averaging time carcinogenic exposure = 25,550 days
- Averaging time non-carcinogenic exposure = 2,190 days
- Ingestion rate = 133 milligrams soil per day (time-weighted average [TWA])
- Inhalation rate = 4.8 cubic meters per day (TWA)
- Particulate concentration = 0.00076 milligrams per cubic meter
- Surface area = 3,700 square centimeters per day (TWA)
- Adherence factor = 0.2 milligrams per square centimeter (TWA)

Recreational Adult Exposure

- Exposure duration = 24 years
- Exposure frequency = 20 days per year
- Body weight = 52 kilograms (TWA)
- Averaging time carcinogenic exposure = 25,550 days
- Averaging time non-carcinogenic exposure = 8,760 days
- Ingestion rate = 100 milligrams soil per day (TWA)

- Inhalation rate = 20 cubic meters per day (TWA)
- Particulate concentration = 0.00076 milligrams per cubic meter
- Surface area = 5,700 square centimeters per day (TWA)
- Adherence factor = 0.27 milligrams per square centimeter (TWA)

The risks for the on site worker exposure scenario was evaluated using the following exposure parameters:

- Exposure duration = 25 years
- Exposure frequency = 165 days per year (365 - November to February [120 days] – vacation [15 days] – 2 days per week [65 days])
- Body weight = 70 kilograms
- Averaging time carcinogenic exposure = 25,550 days
- Averaging time non-carcinogenic exposure = 9,125 days
- Ingestion rate = 100 milligrams soil per day
- Inhalation rate = 20 cubic meters per day (TWA)
- Particulate concentration = 0.00076 milligrams per cubic meter
- Surface area = 5,700 square centimeters per day
- Adherence factor = 0.15 milligrams per square centimeter

Individual HQs and relative percent contributions to total risk for arsenic in soil for each exposure scenario are summarized in Table 5-14.

TABLE 5-14

RISK VALUES FOR ARSENIC IN SOIL
SPRING MEADOW LAKE SITE

Site Area	Exposure Scenario	Arsenic Risk Values for Soil	
		Carcinogenic	Noncarcinogenic HQ
Spring Meadow Lake – East Arm Area	Recreational Child	1.3 E-04	2.6
Spring Meadow Lake – East Arm Area	Recreational Adult	1.1 E-04	0.73
Montana Wildlife Center	On-site Adult Worker	2.2 E-03	14

Notes:
HQ Hazard Quotient (relative toxicity value for a single metal in a single medium)

EPA guidance on exposure levels that are considered protective of human health is presented to aid in interpreting the results of the risk assessment. EPA defined general remedial action goals for sites on the National Priorities List in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 of the *Code of Federal Regulations* Part 300.430). The goals include a range for residual carcinogenic risk, which is "an excess upper-bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}," or 1 in 10,000 to 1 in 1,000,000. The goals set out in the NCP are applied once a decision to remediate a site has been made. A more recent EPA directive (EPA 1991b) provides additional guidance on the role of the HHRA in supporting risk management decisions, and in particular, deciding whether remedial action is necessary. Specifically, the guidance states, "Where cumulative carcinogenic risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the noncancer HQ is less than 1, action generally is not warranted unless there are adverse environmental impacts." Nevertheless, all carcinogenic risks and noncarcinogenic hazards are presented to facilitate risk management decisions.

As can be seen in Table 5-13, in risk calculations for the Spring Meadow Lake site the child and adult recreational and on-site worker exposure scenarios resulted in carcinogenic risk values that were within or above the risk management range of $1x10^{-4}$ to $1x10^{-6}$ for carcinogens. The noncarcinogenic HQ exceeds the threshold value of 1 only for the child recreational user and the on-site worker. The east arm and the Montana Wildlife Center area contain arsenic at concentrations that pose potential risks to human health.

The risk from lead was evaluated qualitatively by comparing the 95%-UCL of lead in site soils with a recreational soil lead value of 550 mg/kg and to EPA Region IX industrial soil PRG (750 mg/kg). Table 5-15 lists the qualitative risk evaluation for lead under the adult and child recreational user and on-site worker exposure scenarios. Areas with elevated lead concentrations are located across the site, with the highest concentrations found around the former Stedman Foundry building area (TP-107).

Uncertainties in the Risk Calculations

Uncertainty in the risk values calculated can be created by a number of factors, including: (1) exclusion of exposure pathways from the risk calculation, (2) exclusion of potential hazardous constituents, (3) inaccurate land use and exposure values, (4) the accuracy of the toxicity values, and (5) the accuracy of the exposure point concentrations. Table 5-16 lists the relative effect of each of these sources of error on the risk values calculated. Each uncertainty factor is discussed below.

TABLE 5-15

RISK VALUES FOR LEAD IN SOIL
SPRING MEADOW LAKE SITE

Criterion (mg/kg)	Recreational 550	On Site Worker 750
Number of Samples	32	14
Number Above Criteria	10	4
Maximum Concentration (mg/kg)	6,180	16,300
Minimum Concentration (mg/kg)	20	18
Mean Concentration (mg/kg)	631	1,563
RME Concentration (mg/kg)	976	2,812

Notes:
mg/kg Milligrams per kilogram
NA Not applicable

TABLE 5-16

SUMMARY OF UNCERTAINTIES FOR RISK ASSESSMENT
SPRING MEADOW LAKE SITE

Source of Uncertainty	Probable Effect
Exclusion of exposure pathways from the risk calculation	Underestimate <1 OM
Exclusion of potentially hazardous constituents	Underestimate <1 OM
Inaccurate land use and exposure values	Overestimate up to 1 OM
Accuracy of the toxicity values	Overestimate up to 1 OM
Accuracy of the exposure point concentrations	Over- or under-estimate << 1 OM

Notes:
OM Order of Magnitude

(1) **Exclusion of exposure pathways from the risk calculation**. The exclusion of exposure pathways from risk calculations because of data gaps or the lack of applicable toxicity values will cause an underestimation of potential risk. The total site risk is the sum of the individual risks posed by each pathway (for example, soil, sediment, surface water).

(2) **Inaccurate land use and exposure values**. The exclusion of potentially hazardous constituents because field data are unreliable will result in the underestimation of risk. The total site risk is the sum of all risks from potentially hazardous constituents present in all media. The exclusion of contaminants from the risk calculations as a result of inferior data quality results in reduction of the calculated risk values. The amount of underestimation regarding risk posed by these metals is unknown, but is probably less than one order of magnitude.

(3) **Accuracy of the toxicity values**. Conservative estimations surrounding land use and exposure assumptions will result in an overestimation of site risks. The land use assumptions were based on visual inspections of the site. All areas with the potential for recreational use by humans (east arm) were included in the recreational risk area. The exposure assumptions used in the risk assessment are standard values thought to be conservative. The amount of overestimation of risk because of these assumptions is unknown, but is not likely to exceed one order of magnitude.

(4) **Accuracy of the exposure point concentrations**. The magnitude of toxicity values strongly affects the calculated risk value. However, the reference toxicity values used in the current risk assessment were conservative in nature, likely resulting in an overestimation of site risk. The methodology used to develop reference toxicity values assures that the value will overestimate rather than underestimate the potential risk. The toxicity values calculated during this risk assessment are also likely to be conservative since they are derived from conservative starting points using conservative assumptions. The amount of overestimation from the use of toxicity values is unknown, but should not exceed one order of magnitude.

(5) **Exclusion of potentially hazardous constituents**. The accuracy of calculated exposure point concentrations is unknown. However, the calculated exposure point concentrations used in this risk assessment are likely to result in an underestimation of risk. Since a mean or average concentration of metals in soil was used in the risk assessment, there are many areas with above-average concentrations of metals. Thus, the risk to a receptor exposed to areas with higher metal concentrations would be underestimated. Depending on the metal in question, the risk posed may be greater or lesser than was estimated by the risk assessment.

5.5.5 Risk-Based Cleanup Goals

Risk-based cleanup goals are calculated to allow for the design and implementation of reclamation activities. Tables 5-14 and 5-15 show the risks for arsenic and lead for the child and adult recreational user and the on-site worker exposure scenarios for the Spring Meadow Lake. Table 5-17 lists the cleanup goals for lead and arsenic in soil for carcinogenic and noncarcinogenic risks for the recreational child and on-site worker land use scenarios.

TABLE 5-17

RECREATIONAL RISK-BASED CLEANUP GOALS
SPRING MEADOW LAKE

Exposure Scenario	Lead	Arsenic		
		Carcinogenic		Noncarcinogenic
		10-5	10-4	HQ = 1
Recreational child (mg/kg)	400[a]	110	1,100	550
On-site Worker (mg/kg)	750	23	230	380

Notes:

a Recreational lead based on Residential PRG

mg/kg Milligrams per kilogram
10-5 1×10^{-5} Cancer risk
10-4 1×10^{-4} Cancer risk
HQ Hazard quotient

5.5.6 Risk Characterization Summary

The risk values summarized for the Spring Meadow Lake in Tables 5-18 and 5-19 indicate that the site poses potential risks to children and adult recreational users and to the on-site workers at the Montana Wildlife Center. The calculated HQs can be used to determine whether human receptors are potentially exposed to harmful doses of site-related contaminants via the high-use recreational scenarios evaluated.

TABLE 5-18

SUMMARY OF TOLERABLE AND PHYTOTOXIC SOIL CONCENTRATIONS (mg/kg dry weight)
SPRING MEADOW LAKE SITE

Element	Tolerable Soil Level (CH2M Hill 1987)	Phytotoxic Soil Concentrations (Kabata-Pendias and Pendias 1989)
Arsenic	50	15 to 50
Lead	25	100 to 400
Zinc	50	70 to 400

Notes:
mg/kg milligrams per kilogram

TABLE 5-19

MAMMALIAN TOXICOLOGICAL DATA FOR INORGANIC METALS
SPRING MEADOW LAKE SITE

Dose	Arsenic	Lead	Zinc
NOAEL[a] - Rat	3.2	0.05	55
LOAEL[b] - Rat	6.4	5	571
References	ATSDR 1993a	ATSDR 1993b; Eisler 1988b	Maita and others 1981
Lethal - Deer	34	NA	NA
Reference:	Eisler 1988a	NA	NA

Notes:

[a]	No Observed Adverse Effect Level (NOAEL)
[b]	Lowest Observed Adverse Effect Level (LOAEL)
NA	Not available
ATSDR	Agency for Toxic Substances and Disease Registry

All units are milligrams per kilogram per day (mg/kg/d)

Arsenic and lead were above criteria used for screening in the east arm. Eleven of the 32 samples collected during the RI from the east arm contained arsenic at concentrations above the 550 mg/kg level that equated to a HQ of 1.0. Soils with the elevated arsenic levels (above 550 mg/kg) were also the same materials that contained lead above 400 mg/kg in all cases except one sample (TP-155A). Using the risk-based cleanup levels for arsenic therefore would also remove the highest lead-contaminated soil.

The Montana Wildlife Center contains surface and subsurface materials with higher levels of arsenic and lead compared with the east arm. The more intensive use scenario for a typical on-site worker provides the rationale for removing materials to a more conservative (lower concentration) cleanup level. The arsenic carcinogenic point-of-departure (1 in 10,000 or 1 E-05) corresponds to a cleanup level of 23 mg/kg. The concentration of arsenic that corresponds to an HQ of 1.0 for noncarcinogens was 380 mg/kg. Twelve of the 14 Montana Wildlife Center samples contained arsenic at a concentration above 23 mg/kg, and two samples contained arsenic above 380 mg/kg. Using arsenic to define the material for cleanup at the Montana Wildlife Center would also remove the soil with the highest concentrations of lead.

The distribution of arsenic and lead in surface and subsurface materials at the east arm and the Montana Wildlife Center constitute probable adverse human health effects for children and adult recreational users and to on-site workers at the Montana Wildlife Center. Consequently, cleanup measures for the site are warranted.

5.6 ECOLOGICAL RISK ASSESSMENT

An ecological risk assessment was conducted for the Spring Meadow Lake site to evaluate potential impacts to the terrestrial plant communities and to aquatic organisms and their habitats. The ecological risk assessment was a qualitative screening-level ecological risk assessment (SLERA) because of the limited and indirect nature of the data available for the site. The assessment involved the initial identification of COCs, followed by development of an exposure assessment, an ecological effects assessment, and a risk characterization.

The SLERA for the Spring Meadow Lake site used several key federal guidance documents, including: (1) EPA's "Risk Assessment Guidance for Superfund: Volume II - Environmental Evaluation Manual" (EPA 1989b); (2) EPA's "Framework for Ecological Risk Assessment" (EPA 1992); (3) EPA's "Wildlife Exposure Factors Handbook" (EPA 1993b); and (4) "EPA's Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment" (EPA 1994). The mill waste at the site may pose a potential risk not only to humans but also to plants and animals that come into contact with them. SLERAs exclude the potential for effects on people and domesticated species, such as livestock. However, the health of people and domesticated animals is inextricably linked to the quality of the environment shared with other species.

The SLERA estimates the effects of taking no action at the site and involves four steps: (1) identification of contaminants, ecological receptors, and ecological effects of concern; (2) an exposure assessment; (3) an ecological effects assessment; and (4) risk characterization. These four tasks are accomplished by evaluating available data and selecting contaminants, species, and exposure routes of concern, estimating exposure point concentrations and intakes, assessing the ecological toxicity of the COCs, and characterizing overall risk by integrating the results of the toxicity and exposure assessments.

Environmental contaminants at the Spring Meadow Lake site that could affect ecological receptors include high concentrations of metals in the mill-processing debris. The waste materials and vegetation in the area are easily accessible to wildlife and could result in significant ecological effects. The objective

of this SLERA is to estimate current and future effects of implementing the no-action alternative at the Spring Meadow Lake site.

5.6.1 Contaminants and Receptors of Concern

The purpose of this SLERA was to assess the potential for contact between ecological receptors and the COCs. The qualitative results of the SLERA may be used to evaluate the need for and the extent of the reclamation efforts. In addition, the SLERA is useful in identifying the exposure pathways and biological characterization of the site, which are important for the human health risk assessment.

Contaminants of Concern

To be considered a COC, the metal must be detected at the site; data must be available that meet QA/QC criteria; and the metal must be present at concentrations above background. The analytes that meet these requirements for soil are arsenic, lead, manganese, and zinc. The analytes that meet these criteria for surface water and groundwater are arsenic, manganese, and zinc. Even though manganese is found at high concentrations at the Spring Meadow Lake site, the exposure pathway for this metal to site ecological receptors is not complete. Therefore, manganese is discussed as a potential site contaminant, but was not included in the calculation for ecological risk.

Data tables in Section 5.3 summarize the detectable concentrations for metals in soils, sediment, surface water, and groundwater. The following toxicological data pertain to arsenic, lead, and zinc, the primary COCs identified in the SLERA.

Arsenic

Although arsenic occurs naturally in the environment, it is also a teratogen and a “known” carcinogen that can traverse placental barriers and produce fetal death and malformations in many species of mammals (Eisler 1988a). Its bioavailability and toxicity are modified by many biotic and abiotic factors that include the physical and chemical forms of arsenic, the route of exposure, the dosage, and the species of affected organism. In general, inorganic arsenic compounds are more toxic than organic arsenic compounds (that is, arsenicals), and trivalent species (As III) are more toxic than pentavalent species (AS V). Inorganic As (V) is the most commons species in water (USDI 1998). Arsenic has been demonstrated to bioconcentrate, but not biomagnify, in certain organisms (Eisler 1988a).

Terrestrial plants accumulate arsenic by root uptake from the soil and by adsorption of airborne arsenic deposited on the leaves. Studies have shown that certain plant species can accumulate substantial levels (ATSDR 1993a). The effects of arsenic on mammals vary by species, exposure route or pathway, and the physical and chemical form of the arsenic. Many mammals can rapidly excrete ingested inorganic arsenic (Eisler 1988a). However, arsenic is distributed to most tissue compartments, including placental and fetal tissues.

In aquatic environments, adverse effects of arsenic have been reported for a wide range of concentrations in water, sediments, and diets (USDI 1998). Gilderhus (1966), Spehar and others (1980), Suter and Mabrey (1994), and USDI (1998) have all evaluated toxicological benchmarks for screening arsenic in plants, invertebrates, fish, birds, amphibians/reptiles, and mammals. A summary of the earlier reported biotic effects of arsenic was included in USDI (1998). Levels of arsenic in aquatic invertebrates are not well defined, but some individual organisms showed no adverse effects below a tissue level of 30 mg/kg dry weight (USDI 1998). Gilderhus concluded that growth of immature bluegills slowed to some degree when the whole-body arsenic was 1 to 3 parts per million (ppm; dry weight basis). Schmitt and Brumbaugh (1990) determined that a no-effect level for fish equaled 1.0 mg/kg (dry weight basis).

Lead

Lead has been known to be a common pollutant and a potent environmental poison capable of altering normal blood formation and nervous system functions of the human body (Eisler 1988b). When absorbed in excessive amounts, lead can have carcinogenic properties, impair reproduction and liver and thyroid function, and interfere with resistance to infectious disease (EPA 1984). Lead is toxic in most of its chemical forms and can be incorporated into the body via inhalation, ingestion, dermal absorption, and placental transfer. Lead is also a known mutagen and teratogen.

The fate of lead in soil and soil solutions is affected by a variety of factors, including precipitation of sparingly soluble forms of lead; formation of relatively stable organic-metal complexes or chelates with soil organic matter; the soil's pH, CEC, and organic matter content; and the amount of lead in the soil (ATSDR 1993b). Most forms of lead are retained rather strongly in soil; thus, very little tends to leach from the soil. Lead can be transported via erosion of soil particulates that contain lead, which can then be deposited in surface waters (ATSDR 1993b). Lead is not an essential element for plants, and excessive

amounts have been shown to inhibit growth (Eisler 1988b). The effects of lead on mammals can include growth retardation, delays in maturation, and reduced body weight.

Zinc

Zinc is found in fairly uniform concentrations in rocks and soils and may range from about 10 ppm to 120 ppm (Kabata-Pendias and Pendias 1989). Zinc is considered an essential nutrient for both plants and animals. Soluble forms of zinc are easily taken up by plants, particularly by the root systems. Zinc will commonly accumulate in the upper soil horizons during soil weathering processes. Zinc is not considered highly phytotoxic, but zinc toxicity is more prevalent in acidic soils. Several plant species and genotypes are known to have evolved a degree of tolerance to elevated levels of zinc in soils, and some species may accumulate large amounts of the metal without showing overt symptoms of toxicity. Chlorosis (seen mainly in newly developed leaves) and depressed plant growth are the common symptoms of zinc toxicity (Kabata-Pendias and Pendias 1989).

Ecological Receptors of Concern

A variety of aquatic invertebrates, fish, amphibians and reptiles, birds, and small mammals are part of the general food web for the Spring Meadow Lake site, and many more species could be included in a more extensive ecological assessment. This SLERA has identified three groups of ecological receptors that are potentially affected by chemical contamination at the Spring Meadow Lake site. The first group of potential receptors is the terrestrial plant communities. Plant communities are of concern because they represent the first trophic level in the food chain and are consumed by many higher trophic level animals.

The second group of potential ecological receptors is the terrestrial wildlife that may use the area as part of their home range, including mule deer. Tetra Tech personnel observed evidence of use by mule deer during the RI field investigation. Grazing by wildlife species at this site is of concern based on the potential that they may consume contaminated vegetation, soil, and evaporative salts. The only terrestrial wildlife receptors evaluated in a quantitative manner in this ecological risk assessment are deer. Deer are assumed to represent the highest level of exposure to site contaminants, and the effects to deer can apply to other potential receptors.

The third group of potential receptors is the aquatic community, specifically aquatic invertebrates and fish. Spring Meadow Lake has an array of aquatic invertebrates and microorganisms that support various

fish populations. The fish are prey for several species of birds that have been observed in the vicinity, including great blue herons and osprey. In addition, recreational enthusiasts frequently fish at the Spring Meadow Lake site and consume the fish that have been caught. Human health could be indirectly affected by this group of ecological receptors.

Ecological Effects of Concern

One ecological effect observed is that vegetation in some areas (source areas) on site is sparse and lacking in species diversity. The lack of vegetation and diversity in these areas may be partially a result of toxic and inhibitory levels of metals in the plant root zone, along with other detrimental physical and chemical (infertility) properties of the soil. A second ecological effect of concern is the potential for deer and other wildlife to ingest contaminated vegetation, water, and evaporative salts that may form on the tailings materials deposited on the surface. The third ecological effect of concern is the potential biomagnification of metals in the aquatic habitat through uptake of metals by plants and aquatic invertebrates and their consumption by fish in Spring Meadow Lake.

5.6.2 Exposure Assessment

The exposure point concentrations for the recreational and worker areas listed in Table 5-16 were used for the exposure point concentrations for ingestion by deer and phytotoxicity. Exposure point concentrations used for this SLERA (see Table 5-16) are the upper 95th percentile confidence limit of all surface soil and surface water samples collected at the Spring Meadow Lake site. Aquatic life was evaluated using data for water sample SW-203 and sediment sample SD-208. Sample SW-203 was collected from the east arm, and sample SD-208 was collected from the southern end of Spring Meadow Lake. Additionally, DEQ and FWP collected samples of aquatic invertebrates and two fish species to evaluate the potential for sublethal levels of metals to accumulate in the invertebrates and fish. The ingestion of water by deer was evaluated using data from sample SW-203.

The three exposure scenarios discussed below were used to assess ecological risk. However, the only scenario that involved the calculation of a dosage was one in which deer ingests contaminated soil, water, or salt. Contaminant criteria and toxicological indices used to assess both contamination and risk for the exposure scenarios were compiled from the following primary documents:

- Terrestrial plant communities: Gough and others 1979; Shacklette and Boerngen 1984; Kabata-Pendias and Pendias 1989; CH2M Hill 1987

- Terrestrial wildlife: Eisler 1988a and b; ATSDR 1993a and b; EPA 1993; Beyer and others 1994
- Aquatic life: Eisler 1988a and b; Long and Morgan 1991; USDI 1998, Tetra Tech 1996

Plant - Phytotoxicity Scenario

This scenario involves the limited ability of various plant species to grow in soils or mine wastes that contain high concentrations of arsenic, lead, and zinc. Plant sensitivity to certain arsenic compounds is so great that these compounds were used as herbicides for many years. Phytotoxic criteria reported in the literature for total arsenic in soils ranged from 15 to 50 mg/kg; the 50 mg/kg hazard level was considered appropriate for the Helena Valley, Montana (CH2M Hill 1987). Lead is also considered toxic to plants. Numerous phytotoxic concentrations are reported in the literature and generally range from 100 mg/kg (Kabata-Pendias and Pendias 1989) to 1,000 mg/kg (John and Van Laerhoven 1972, CH2M Hill 1987).

Deer Ingestion Scenario

Estimates of total intake dosage for deer are based on reported literature values and the following assumptions: (1) the sparsely vegetated areas do not provide deer habitat; (2) native vegetation is growing across most areas of the mill-processing site and would be available to deer that graze in the area; and (3) the average weight of an individual adult deer is 68.04 kilograms (150 pounds).

Contaminated Soil and Salt Intake

The daily salt uptake for deer is based on data in "Elk of North America" (USDA 1995), which reported a range of 1 to 11 pounds (average 6 pounds) in 1 month for a herd of 50 to 75 elk (average 63 head). Assuming deer require 50 percent of the volume of salt required by elk, a median exposure (non-conservative) approach would equate to an average salt use of 3 pounds per month. Using the average herd size of 63, the average individual salt uptake would equal 0.0016 pounds per day (lbs/day), or 0.00072 kilograms per day (kg/day). Beyer and others (1994) estimated that soil ingestion accounts for less than 2 percent of the average Wyoming mule deer's diet of 1.39 kg/day of vegetation and would equal 0.0278 kg/day of soil. The arithmetic average concentrations of metals for the surface soils across the smelter site were used for both the salt and soil levels since these were the highest values calculated.

Metals in Vegetation Intake

Beyer and others (1994) estimated that an average mule deer ingests 1.39 kg of vegetation per day in summer. No samples of vegetation were collected for analysis during the RI. The concentrations of arsenic (50 ppm) and lead (25 ppm) used in this calculation were the tolerable levels in vegetation (lowest phytotoxic tissue levels) from the East Helena assessment (CH2M Hill 1987). The metal-contaminated areas at the Spring Meadow Lake site cover 20 acres. This area would represent 6 percent of an estimated average mule deer's home range of 90 to 600 acres (average of 345 acres; Beyer and others 1994).

Aquatic Life Scenario

This scenario involves the limited ability of aquatic organisms to survive in waters that have been contaminated with mining wastes, specifically metals. The toxicity of metals to aquatic organisms depends on the concentration of the metals in the surface water and sediment as well as other conditions, such as water hardness, temperature, and pH.

Arsenic

Arsenic can be lethal to fish and insects and has been found to impair reproduction at low concentrations. Although it is known to bioconcentrate, arsenic has not been found to biomagnify in the food chain (Eisler 1988a; Long and Morgan 1991). The concentrations of arsenic in water are normally less than 10 micrograms per liter (µg/L) (Eisler 1988a), and approximately 1 mg/kg (dry weight basis) is reported to be a no-effect level for freshwater fish (Schmitt and Brumbaugh 1990). Arsenic levels in sediment range from 8.2 mg/kg (dry weight basis) or less as the no adverse effects level, to a concentration of 70 mg/kg (dry weight basis) or higher as a toxicity threshold (Long and others 1995).

Lead

Lead concentrations have been shown to affect early life stages of aquatic macrophytes, especially in soft water at warmer temperatures. Nonlethal effects of lead on fish include excess mucus formation that interferes with respiration, spinal curvature, damage to organs, and reduced swimming ability. Lead is only minimally biomagnified in the food chain (Eisler 1988b).

Zinc

Although zinc is an essential nutrient to aquatic biota, toxic effects at high concentrations can include mortality, reduced growth, and inhibited reproduction. Embryos and juveniles have been found to be most sensitive to the effects of zinc. In addition, the effects of zinc on aquatic organisms are increased by the presence of other metals, such as cadmium and mercury.

5.6.3 Ecological Effects Assessment

The effects of the COCs at this site are described in several literature sources and are not repeated here. No site-specific toxicity tests were performed to support this SLERA. Only existing and proposed toxicity-based criteria and standards were used for this SLERA. The following sections detail the specific standards and data that were used for comparison to the analytical results of the RI field sampling investigation.

Plant - Phytotoxicity Scenario

A summary of the phytotoxicity for selected metals of concern (Kabata-Pendias and Pendias 1989) is provided in Table 5-17. These concentrations were used for comparison to mean concentrations of metals in mill waste. The availability of contaminants to plants and the potential for plant toxicity depends on many factors, including soil pH, soil texture, nutrients, and plant species.

Deer Ingestion Scenario

Adverse effects data for test animals were obtained from the ATSDR toxicological profiles (1993a, 1993b), and from other literature sources (Eisler 1988a, 1988b). The data consist of dose (intake) levels that either cause no observed adverse effects (NOAEL) or the lowest dose observed to cause an adverse effect (the LOAEL) in laboratory animals. The use of effects data for other species introduces an uncertainty factor to the assessment; however, effects data for all metals are not available for the species of concern (deer). The lethal arsenic dose of 34 (mg/kg/d) for deer (Eisler 1988a) is also included. Data for laboratory animals (primarily rats) have been adjusted only for increased body weight. These data are listed in Table 5-18.

Aquatic Life Scenario

Montana water quality standards were used for comparison of analytical data from the Spring Meadow Lake water samples. Analytical results were adjusted for conditions such as water hardness, temperature, and pH, which can affect the toxicity of metals to aquatic organisms in surface water bodies. Montana water quality standards for aquatic life are presented in Table 5-20. Concentrations of arsenic in samples of aquatic invertebrates and bass and pumpkinseed fish were generally compared with reported screening levels in the literature (USDI 1998).

5.6.4 Risk Characterization and Summary

This section combines the ecological exposure estimates and concentrations presented in Section 5.6.2 and the ecological effects data presented in Section 5.6.3 to provide a screening-level estimate of potential adverse ecological impacts for the scenarios evaluated. This screening-level estimated was achieved by generating "ecological impact quotients" (EQ) analogous to the hazard quotients calculated for human exposures to noncarcinogens. EQs were calculated for each COC by exposure scenario or receptor type and are summarized in Table 5-21. Contaminant-specific EQs were generated by dividing the intake estimate or concentration by available ecological effect values or concentrations. Tables that summarize the risk calculations are found in Appendix 5-C. As with hazard indexes, if EQs are less than 1, adverse ecological impacts are not expected at the Spring Meadow Lake site.

TABLE 5-20

MONTANA SURFACE WATER QUALITY AQUATIC LIFE STANDARDS (µg/L)

Metal	Acute Toxicity	Chronic Toxicity
Antimony (Sb)	88[a]	30[a]
Arsenic (As) – inorganic	340	150
Barium (Ba)	1,000[b]	--
Cadmium (Cd)	1.05[c]	0.16[c]
Chromium (as Cr^{+3})	1,804[d]	86[d]
Chromium (as Cr^{+6})	16	11
Cobalt (Co)	--	--
Copper (Cu)	7.3[c]	5.2[c]
Cyanide (CN) – total	22	5.2
Iron (Fe)	--	1,000
Lead (Pb)	82[d]	3.2[d]
Manganese	50[b]	--
Mercury (Hg) – total	1.7	0.91
Nickel (Ni)	261[c]	29[c]
Zinc (Zn)	67[c]	67[c]

Notes:

[a] U.S. EPA (1986) criteria used since the contaminant is not included in Montana standards.

[b] Ambient water quality standards for protection of human health through consumption of fish.

[c] At 50 mg/L hardness.

[d] At 100 mg/L hardness.

-- Standard has not been adopted, or information is currently unavailable.

Reference: Montana Department of Environmental Quality (2001). Montana Numeric Water Quality Standards (Circular WQB-7), Water Quality Division, Helena, Montana.

TABLE 5-21

ECOLOGICAL IMPACT QUOTIENTS SPRING MEADOW LAKE SITE

Receptor	Arsenic	Lead	Zinc	Total EQ By Receptor
Plant Phytotoxicity	7.46 (65)	1.30 (11)	2.72 (24)	11.48 (100)
Deer Ingestion	0.00 (0)	1.74 (100)	0.00 (0)	1.74 (100)
Aquatic Life – Surface Water	0.09 (43)	0.04 (19)	0.08 (38)	0.21 (100)
Aquatic Life – Sediment	1.29 (20)	2.90 (45)	2.29 (35)	6.48 (100)
TOTAL EQ BY COC	8.84 (44)	5.97 (30)	5.09 (26)	19.91 (100)

Notes:

( )	Percent contribution to total receptor EQ.
EQ	Ecological Impact Quotient (relative toxicity value for a single metal in a single medium)
NA	Not applicable
COC	Contaminant of concern
<	Less than

Plant - Phytotoxicity Scenario

Maximum concentrations of metals collected from the source area at the Spring Meadow Lake site were compared with high values of the range of plant phytotoxicity derived from the literature. One limitation of this comparison is that the phytotoxicity ranges are not species-specific; instead, they represent toxicity to species that may or may not be present at the Spring Meadow Lake site. Additionally, other physical characteristics of the waste materials may create microenvironments that limit growth and survival of terrestrial plants directly or in combination with substrate toxicity.

Mill waste materials are likely to contain elevated concentrations of metals, low organic content, and limited nutrients, and may harden enough to resist root penetration. The results of the EQ calculations for this scenario are presented in Table 5-21. The EQs calculated for plant phytotoxicity at the Spring Meadow Lake site exceeded 1.0 for arsenic, lead, and zinc. The non-conservative assumption of using the high end of the phytotoxicity range to derive the EQs may underestimate the potential phytotoxic effect to some plant communities. However, several other factors in addition to phytotoxicity combine to adversely affect plant establishment and successful reestablishment on waste materials. In addition, the maximum concentrations of metals in soil were used as the plant dosage value in the EQ calculation, presenting the likelihood of an overly conservative EQ.

Deer Ingestion Scenario

Estimated ingestion doses for deer were compared with the higher of the literature-derived toxicological effect levels (that is, the LOAEL). The contaminant-specific EQs were generated by dividing the total intake estimates by the toxicological effects values. Again, the comparison is limited because effects data for other species (rat) were used that were adjusted only for increased body weight. The species used in the toxicological studies may have been more or less susceptible to the contaminant in question than are deer. The results of the EQ calculations for this scenario are also presented in Table 5-21.

The EQs calculated for the deer ingestion scenario exceeded 1.0 for lead only. This EQ indicates a potential risk to deer and other wildlife as a result of lead concentrations in surface soils.

The assumptions used to derive the uptake dose and the comparison to toxicity in rats may incorrectly estimate the actual average contaminant intake for deer. This potential for an adverse effect can be extended to other wildlife that may also use the area as a source for food and salt.

Aquatic Life Scenario

Maximum concentrations in surface water, sediment, aquatic invertebrates, and fish collected from the Spring Meadow Lake site were compared with acute aquatic water quality criteria and other toxicity screening levels derived from Long and Morgan (1991) and USDI (1998). The presence and persistence of metals in the sediments and near-shore soils may affect the aquatic life in Spring Meadow Lake. The results of the EQ calculations for this scenario are presented in Table 5-21.

Information presented in Table 5-21 indicates that the potential exists for adverse ecological impacts of sediment and near-shore soils to aquatic life communities at the Spring Meadow Lake site. However, the levels of arsenic in aquatic invertebrates and fish samples collected by DEQ and FWP were below the USDI (1998) and other reported screening levels (Schmitt and Brumbaugh 1990). The EQs for sediment exceeded 1.0 for arsenic, lead, and zinc. The EQs for surface water were less than 1.0 for all three metals.

Risk Characterization Summary

The calculated EQs can be used to determine whether ecological receptors are potentially exposed to harmful dosages of site-related contaminants via the three ecological scenarios evaluated. The EQs calculated for the Spring Meadow Lake site indicate that arsenic is the greatest overall risk driver for the site, with an EQ of 8.84. The risk posed by arsenic is split among plant toxicity (EQ = 7.46), aquatic life-surface water (EQ = 0.09), and aquatic life-sediment (EQ = 1.29). Arsenic poses virtually all (100 percent) of the risk to plants. Lead (EQ = 5.97) poses a significant risk to aquatic organisms through sediments (EQ = 2.90), to deer through ingestion (EQ = 1.74), and to plants (EQ = 1.30). Zinc (EQ = 5.09) poses a threat to aquatic organisms in sediments (EQ = 2.29) and to deer (EQ = 2.72).

Collectively, these calculated EQs and qualitative observations demonstrate that contaminants at the site constitute probable adverse ecological effects for plants, deer, and aquatic life at the Spring Meadow Lake site.

5.7 SUMMARY AND CONCLUSION

The Spring Meadow Lake Site includes two main areas: the east arm and the Montana Wildlife Center. Both sites contain mill processing wastes and metal-contaminated soils at concentrations above the recommended cleanup levels. The nature and extent of the mill process wastes, the potential impacts to

human health, and the potential impacts to the environment are summarized below. Specific findings related to potential environmental impacts and risks to ecological receptors have not been derived. Removal or isolation of the mill process wastes and associated contaminated materials would minimize potential risks to site workers, recreational users, and ecological receptors.

A screening-level human health risk assessment was conducted for the Spring Meadow Lake site as part of the RI performed in spring 2005. The risk assessment was conducted using current guidance set forth by EPA (1989a) and was updated to reflect the recreational use for Spring Meadow Lake east arm and for on-site workers for the Montana Wildlife Center. Conservative risk-based cleanup levels for arsenic and lead were used for the recreational and on-site worker scenarios. Elevated concentrations of lead were rarely found without a corresponding elevated level of arsenic. Therefore, any removal activities that focus on cleaning up arsenic above the risk-based cleanup level will also address the lead contamination.

5.7.1 East Arm Area

The mill process wastes and contaminated soils are found on or near the surface (upper 4 feet) in the east arm. Characterization efforts identified the contaminated materials with elevated concentrations of arsenic (maximum of 10,400 mg/kg) and lead (maximum of 6,180 mg/kg). Recommended removal depths have been selected based on potential risks to humans and the environment. Contaminated mill process waste materials deposited in the east arm have likely eroded into the lower ponded areas (actual Spring Meadow Lake east arm), where sediments and shoreline materials were found with elevated levels of arsenic (maximum of 2,130 mg/kg) and lead (maximum of 1,480 mg/kg). The contaminated sediments and shoreline materials are not completely characterized but have the potential to cause ecological impacts in the east arm. The total volume of surface, subsurface, and shoreline contaminated materials with metals about the recommended cleanup levels in the east arm is estimated at between 15,000 and 20,000 cubic yards.

Surface water samples were collected from 15 locations in Spring Meadow Lake. Arsenic and manganese were found to be elevated above Montana water quality standards (WQB-7) in samples collected from the southern east arm and the south end of Spring Meadow Lake (near the wooden foot bridge). Concentrations of metals in surface water are likely attributed to dissolution from the metal-contaminated sediment and shoreline materials, rather than from groundwater. No metals were found to be elevated in samples from monitoring well MW-02.

5.7.2 Montana Wildlife Center

The Montana Wildlife Center area contains mill process wastes (primarily floatation tailings and manganese mill concentrates) at surface and subsurface locations at this site. An earthen sump (pit) was found to contain mill tailings to a depth greater than 18 feet (the maximum reach of the backhoe bucket) in one location near the east side of the former mill building (burned down and demolished). Test pits and analytical results revealed contaminated mill tailings and other wastes with elevated concentrations of metals to depths generally less than 5 feet below ground surface at other locations at the Montana Wildlife Center. Most of the areas with contaminated subsurface materials have been covered with gravel or with fill materials. Metal salt deposits are visible on the surface in areas where the surface gravel layer or fill material is thin. Characterization efforts revealed contaminated wastes along the east, south, and west sides of the former mill building. The total volume of contaminated materials in the surface and subsurface at the Montana Wildlife Center is estimated at between 10,000 and 15,000 cubic yards. The volumes of metal-contaminated surface and subsurface soils were estimated using a topographic contour map, along with known and interpolated depths of metal contamination across the Spring Meadow Lake site.

Elevated concentrations of arsenic and manganese were detected in the groundwater along the northern edge of the Montana Wildlife Center (MW-01). Groundwater at this location is likely contaminated from the subsurface tailings at this site.

5.8 REFERENCES CITED

Agency for Toxic Substances and Disease Registry (ATSDR). 1993a. *Toxicological Profile for Arsenic.* Agency for Toxic Substances and Disease Registry, Atlanta, Georgia.

ATSDR. 1993b. *Toxicological Profile for Lead.* Agency for Toxic Substances and Disease Registry, Atlanta, Georgia.

Beyer, W.N., E.E. Connor, and S. Gerould. 1994. *"*Estimates of Soil Ingestion by Wildlife*." J. Wildlife Management Volume 58 (Number 2): 375-382*.

California Office of Environmental Health Hazard Assessment (OEHHA). 2005. "Chronic Toxicity Summary. Manganese and Compounds." Retrieved from www.oehha.ca.gov/air/chronic_rels/pdf/mangnREL.pdf. Accessed on June 8, 2005.

CH2M Hill. 1987. "Assessment of the Toxicity of Arsenic, Cadmium, Lead, and Zinc in Soil, Plants, and Livestock in the Helena Valley of Montana." Prepared for: U.S. Environmental Protection Agency, Work Assignment No. 68-8L30.0.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997. "Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1997 Revision." ES/ER/TM-85/R3. Environmental Sciences Division, Oak Ridge National Laboratory. Oak Ridge, Tennessee. November.

Eisler, R. 1988a. "Arsenic Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review." U.S. Fish and Wildlife Service, Biological Report No. 85 (1.12). 92pp.

Eisler, R. 1988b. "Lead Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review." U.S. Fish and Wildlife Service, Biological Report No. 85 (1.14). 134pp.

Gilderhus, P.A. 1966. Some Effects of Sublethal Concentrations of Sodium Arsenite on Bluegills and the Aquatic Environment. Transactions of the American Fisheries Society 95(3):289-296

Gough, L.P., H.T. Shacklette, and A.A. Case. 1979. "Element Concentrations Toxic to Plants, Animals, and Man." U.S. Geological Survey, Washington D.C.

John, M.K. and C. Van Laerhoven. 1972. "Lead (Pb) Uptake by Lettuce and Oats as Affected by Lime, Nitrogen, and sources of Lead." *J. Environmental Quality Volume 1:169-171*.

Kabata-Pendias, A. and H. Pendias. 1989. "Trace Elements in Soil and Plants." 2nd Ed. CRC Press, Inc., Boca Raton, Florida.

Lindsay, W.L. 1979. *Chemical Equilibria in Soils*. John Wiley & Sons, New York.

Long, E.R. and L.G. Morgan. 1991. "The Potential for Biological Effects of Sediment-sorbed Contaminants Tested in the National Status and Trends Program." NOAA Technical Memorandum NOS OMA 52. National Oceanographic and Atmospheric Administration, Seattle, Washington.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management 19:81-97.

Maita, N. and others. 1981. "Subacute Toxicity Studies with Zinc Sulfate in Mice and Rats." *J. Pest. Sci. 6:327-336*.

Montana Department of Environmental Quality (MDEQ). 2001. Human Health Standards for Water, Circular WQB-7, Montana Numeric Water Quality Standards. December

MDEQ-Mine Waste Cleanup Bureau (MWCB), 2004. Abandoned Hard Rock Mine Priority Site Investigation and Hazardous Materials Inventory. Spring Meadow Site, Lewis and Clark County, PA 25-505. (Tetra Tech EM Inc.)

MDEQ-Remediation Division. 2005. Action Level for Arsenic in Surface Soil. April.

National Academy of Sciences. 1980. "Recommended Daily Allowances.". National Academy of Sciences, Food and Nutrition Board, Washington, D.C. 9th Ed. pp. 151-154.

Renewable Technologies Inc. (RTI). 2005. Owner / Operator History and Cultural Resource Investigation. Volume 1: Report. Spring Meadow Lake Site, Lewis and Clark County, Montana. April.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. "Toxicological Benchmarks for Wildlife: 1996 Revision." ES/ER/TM-86/R3. Environmental Sciences Division, Oak Ridge National Laboratory. Oak Ridge, Tennessee. June.

Schmitt, C.J. and W.G. Brumbaugh. 1990. National Contaminant Biomonitoring Program: Concentrations of arsenic, cadmium, copper, lead, mercury, selenium, and zinc in U.S. freshwater fish, 1976-1984. Archives of Environmental Contamination and Toxicology. 19:731-747.

Shacklette, H.T. and J.G. Boerngen. 1984. "Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States." U.S. Geological Survey, Professional Paper 1270. Washington, D.C.

Sobek, A.A., L.R. Hossner, D.L. Sorensen, P.J. Sullivan, and D.F. Fransway. 1987. "Acid-base Potential and Sulfur Forms." In: R.D. Williams and G.E. Schuman (editors): Reclaiming Mine Soils and Overburden in the Western United States; Analytic parameters and procedures. Soil Conservation Society of America, Ankeny, IA. pp. 233-258.

Spehar, R.L., J.T. Fiandt, R.L. Anderson, and D.L. DeFoe. 1980. Comparative Toxicity of Arsenic Compounds and Their Accumulation in Invertebrates and Fish. Archives of Environmental Contamination and Toxicology, 9:53-63.

Suter, G.W. and J.B. Mabrey. 1994. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1994 Revision. Oak Ridge National Laboratory, Tennessee. Report ES/ER/TM-96/R1. Dept. of Energy, Office of Environmental Restoration and Waste Management.

Tetra Tech, Inc. 1996. "Risk Based Cleanup Guidelines for Abandoned Mine Sites: Final Report." Prepared for: DEQ, AMRB. February.

Underwood, E.J. 1971. "Trace Elements in Human and Animal Nutrition, 3rd Ed." New York and London, Academic Press, Inc., 543pp.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS). 2003. Soil Survey of Lewis and Clark County Area, Montana. 329 pp plus maps. January.

U.S. Department of Agriculture (USDA). 1995. "Personal Communication with USDA Forest Service, Helena National Forest personnel." Salt ingestion data taken from "Elk of North America."

U.S. Department of the Interior (USDI). 1998. Guidelines for Interpretation of the Biological Effects of Selected Constituents in Biota, Water, and Sediment – Arsenic. National Irrigation Water Quality Program Information Report No. 3. Participating Agencies: Bureau of Reclamation, U.S. Fish and Wildlife Service, U.S. Geological Survey, Bureau of Indian Affairs. November.

U.S. Environmental Protection Agency (EPA). 1984. "Health Effects Assessment for Lead." Office of Research and Development, Cincinnati, Ohio. EPA/54D/1-86-055. 43pp.

EPA. 1989a. "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Interim Final)." Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002.

EPA. 1989b. "Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual (Interim Final)." Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/001.

EPA. 1991a. Memorandum Regarding the "Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors." From Timothy Fields, Jr. Acting Director Office of Solid Waste and Emergency Response (OSWER). To Distribution. March 25.

EPA. 1991b. Memorandum Regarding the Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. From Ron R. Clay, Assistant Administrator. To Directors, Various Divisions. April 22.

EPA. 1992. "Framework for Ecological Risk Assessment." Risk Assessment Forum, EPA/630/R-92/001.

EPA. 1993a. Toxic Characteristic Leaching Procedure Constituents and Guidelines (Method 1311), 40 Code of Federal Regulations 261.4. August.

EPA. 1993b. "Wildlife Exposure Factors Handbook, Volumes 1 and 2." EPA 600/R-93/187a and b. Washington, D.C.

EPA. 1994. "Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments." Office of Emergency and Remedial Response, Washington, D.C.

EPA. 1995. "Retrieval from the Integrated Risk Information System (IRIS)." Office of Health and Environmental Assessment.

EPA 1998. IRIS, Arsenic, Inorganic. Available at http://www.epa.gov/iris/subst/0278.htm

EPA. 2002a. "Region 9 Preliminary Remediation Goals (PRGs) Table" San Francisco, California. October 1.

EPA. 2002b. "Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Interim Guidance." OSWER. OSWER 9355.4-24. December.

EPA. 2004. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)." Final. EPA/540/R/99/005. Office of Superfund Remediation and Technology Innovation. July.

Washington State Department of Ecology. 1997. Creation and Analysis of Freshwater Sediment Quality Values in Washington State. July.

Will, M.E., G.W. Suter II, R.A. Efroymson, and A.C. Wooten. 1997. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1997 Revision*. ES/ER/TM-85/R3. Environmental Sciences Division, Oak Ridge National Laboratory. Oak Ridge, Tennessee. November.

LEGEND

REMEDIAL INVESTIGATION SAMPLE LOCATIONS:
- MONITORING WELL LOCATION
- SEDIMENT GRAB SAMPLE LOCATION
- SURFACE WATER SAMPLE LOCATION
- SURFACE WATER / SEDIMENT SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- BACKHOE TEST PIT SAMPLE LOCATION

GENERAL FEATURES:
- BUILDING
- ELEVATION CONTOUR-MAJOR (5' INTERVAL)
- ELEVATION CONTOUR-MINOR (1' INTERVAL)
- FENCE
- PEDESTRIAN TRAIL
- RAILROAD TRACK
- TREE

SPRING MEADOW LAKE

EAST ARM

FORMER MILL BUILDING

STEDMAN FOUNDRY

FISH WILDLIFE AND PARKS

FOOT BRIDGE

SD-103 SW-103 SS-220 SW-104 SW-105 SD-206 SS-219 TP-154 SD-205 SD-102 SW-102 TP-122 SD-204 TP-155 SS-208 SS-218 SD-209 SW-201 SD-203 TP-163 TP-123 TP-153 TP-125 SD-111 SW-111 SD-112 SW-112 SS-217 TP-161 TP-156 SD-202 TP-152 TP-124 SD-107 SW-107 SW-202 SS-210 MW-02 TP-162 TP-160 TP-157 TP-151 TP-128 TP-126 TP-167 SD-201 SW-203 SS-211 SD-110 SW-110 SS-216 (A,B,C) TP-166 TP-119 SS-214 SD-207 TP-118 SS-215 TP-164 TP-158 SD-108 SW-108 SD-208 SS-221 SD-109 SW-109 SS-207 TP-159 TP-120 SS-206 TP-127 TP-165 SS-212 TP-117 TP-169 SS-213 MW-01 TP-129 SS-202 SS-203 TP-115 SS-205 SD-101 SW-101 TP-116 TP-172 TP-114 TP-130 TP-101 TP-109 TP-111 TP-108 SS-204 TP-113 TP-112 TP-110 SS-224 TP-104 TP-168 TP-170 TP-106 SS-201 TP-107 TP-171 TP-174 TP-105 TP-173 SS-223 TP-102 TP-121 SS-222 SD-106 SW-106

100 0 100 200

SCALE IN FEET

Tetra Tech EM Inc.

Spring Meadow Lake
Helena, Montana

FIGURE 5-1
REMEDIAL INVESTIGATION
SAMPLE LOCATION MAP

FIG5-1_RI SAMP LOC MAP.dwg - DWH - 06/14/2005 - S1129.30.SMLSRI

APPENDIX 5-A

FIELD LOGBOOK

Montana
Silver Smelter

"Rite in the Rain"
ALL-WEATHER
Horizontal Line
No 200 NF

Tetra Tech EM Inc.
6th & Last Chance Gulch, Suite 612 ♦ Helena, MT 59601

Spring Meadow Lake Site - PA (back half)
June 2004
RI - April 2005

SPRING MEADOW LAKE SITE
April 8, 2005 (FRIDAY)
cool (40°F), cloudy, + windy

4/8/05

1:00pm Mtg w/ City of Helena Utilities & ELM Utility Locators
City of Helena representatives present: Rick, Nathan, Bronson
Sewer: 447-1576 Rick or Bill
water: 447-1567 Bronson or Rick

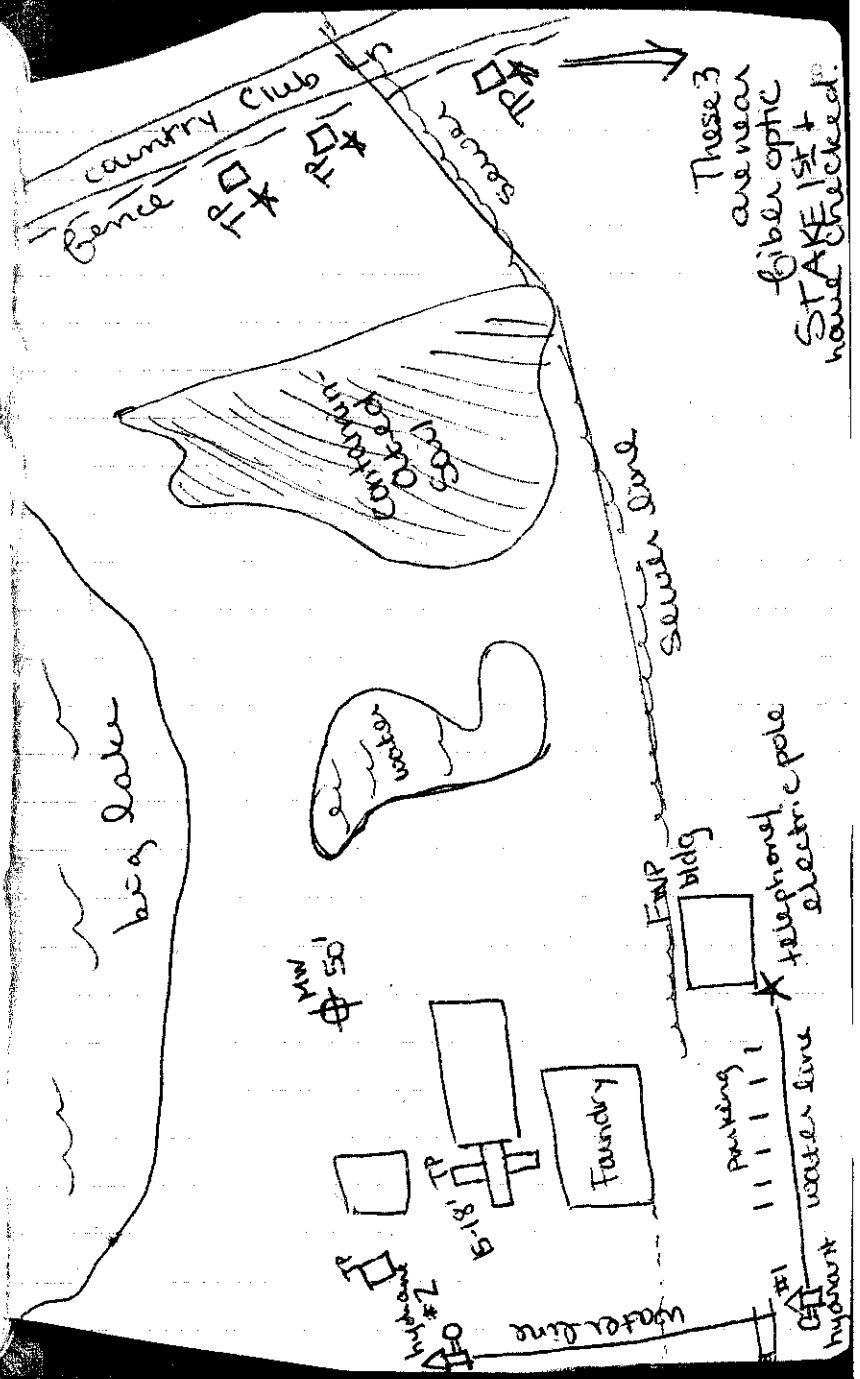
ELM Representative: ~~Keith~~ Jason
459-9502

Water lines: water line runs from electrical pole near FWP bldg (new one) W along fenceline to a hydrant. It then runs N (slight NW) across parking area to another hydrant ~50m (2nd hydrant is within fenced area enclosing old stone bldg on the W end of old bldg). * Should be fine for water & utilities for 15-18' backhoe pits & 50' deep monitoring wells

Sewer lines: Main line runs from parking area E to large contaminated area boundary (as determined in previous sampling) & heads NE toward Country Club Ln (toward houses on E side of road). Manhole covers should be staked + apparent. Check for these when putting in 20' monitoring well. There is just the 1 main line; no branching sewer lines.

* ELM Utility Concern – Fiber Optic lines near the fence by Country Club Ln. 3 of the backhoe pits may be too close (ELM will need to supervise digging within 20' of those lines). Potential pit sites need to be staked – Jason will return once staked + make sure they are 20 ft away from optic cables.

* No info provided on gas lines.



Craig Marr (SML Park Supv) 495-3270

4-11-05 Monday — calm, 50°F (Jerm)

0730 called O'Keefe drilling (Butte). Dave Crowley to depart Butte 0900, meet at SML 1200-1230.

1230 O'Keefe on site SML - mob to MW-02 at SE arm of lake, set up ready to drill 1315.

Driller: Dave Crowley Helper: Marcus Crowley

Rig: Mobile Drill 3-61 on Ford F-900

1345 Drilled to 25', water level approx. 11.6' BGS

1410 Drilled to 30' T.D., To screen 30-20' (.020 slot PVC 2" screen) 10' blank riser

1430 Screen installed, pointed end cap - all cuttings brown silica sand, 1-2" rounded to subrounded gravels - no split-spoon samples obtained

1515 10-20 colorado silica sand to 7.9' bgs (14 Bags) Bentonite 7.9 - 1.0 bgs sand 1-surface - bentonite chips 2' up in casing - stick-up completion

1540 Pre-development SWL = 14.4 BTOPVC Stickup = 2.3' TOPVC

1550 Move off of MW-02, mob to MW-01 inside FWP Wildlife Rehab Unit

1610 Spud MW-01 ±150' E of smaller of two old stone buildings at MT FWP Wildlife Rehab Unit.

4-11-05 (cont.)

1625 - Drilled to 25', water at 23.9

1645 - EOD - 30' T.D., to allow well to stand overnight and construct 4-12 A.M.

90

4-12-05 Tuesday clear-calm

0800 on-site SML FWP wildlife ctr,

0830 Gate unlocked to provide access to rig in FWP wildlife ctr. yard.

0900 Begin sand pack - 30' T.D. MW-01 install .020 2" PVC screen 30-10' bgs (20')

1030 Complete construction - concrete apron at base of stick-up

1100 SWL 23.18
T.D. 32.55
2.1 stickup
> MW-01 at MT Wildlife Rehab ctr.

1130 off-site

Rob Mahr - Olympus Tech. backhoe operator

91

4-18-05 Monday

0900 set-up on TP-151 on NE side SML

TP-151 0900
0-6" depth = TP-151
native soil in low area east side of regraded reject sand.
Veg = Western wheat grass, Meloff Woods rose
0-6" = dark brown SL A-horizon
6-12" " " SL A-B "
12-18" light brown SL B-C horizon

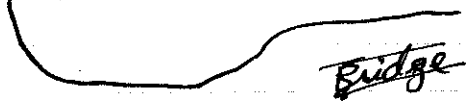
TP-152 0920
Area on top of regraded sand/reject sand. Poor veg on area but probably due to sand-not metals. Veg = ~~Artri~~, Arlu, Agda, Agsm, Stco Rowo
0-4' - dark brown SL "A" maybe
4-8" - sand-(regraded) w/ black lenses
8"+ more sand
Sample 0-8" = TP-152

TP-153 0931
Area = well vegetated w/ grasses & shrubs. Agsm, fescue, Stco, Symalb, small forbs.

TP-153A 0931
0-6" brown fine sandy loam some org. matter & fine roots

TP-153B 0935
18-24" sand w/ black stringers probably natural but?

TP-154A 0945
North end of east arm
Veg is good
Smooth brome
Woro, Dogwood



TP-154A 0945
8-18" Dark clayey sand orange brown tan mottled - Non-native fill

4-5' burnt wood debris fill, from surface to about 5' bgs

TP 154B 0952
5-6'
native sandy gravels, water table at about 4'

TP-155
55' SW of old TP-122

TP-155A 0-4"
Dark brown loamy sand appears to be impacted by surface deposit of Mn
TP-155B 18-24"
mating gravelly sand light brown, moist
No water in pit at 2'

TP-156 - In low area SW of largest cottonwood tree.
Pure fine sand - some darker layer on surface from OM
No dark lens

TP-156A 10"-12" 1025
light brown sand

Buried "soil" or surface at ≈ 3' bgs
TP-156B 36-42" 1030
Buried layer may have some Mn but ?

TP-157A 4-6" 1045
- tan to brown loamy "B" horizon sandy soil, low organics, root mottles, no dark sands noted
TP157B 24-36" 1050
- tan/brown well sorted med. gr. sands with lesser org-brown Fe or stained clay stringers - no dk sands noted

TP-158
By barb-wire fence next to RR tracks
About 15' west of fence
Veg. = poor weedy, Brte, Meoff,

TP-158A 1100
6-9" bgs - dark brown/black sand layer sampled
- Mn-impacted layer may be 12-15" deep.

TP-158B 1105
28-32" bgs - light br. gravelly sand - probably clean.

TP-159 1115
5m about 25' w/ of fence. Black layer is down 4-6". Fine clay sand layer on top - not native. Veg is mod. = St co, rabbitbrush some Ags m.
Dro ds below - native
No sample taken from subsample

TP-159/1 4-6" sample taken from black lens.

TP-160 - In middle of flats
Veg = mostly Ags m, others St co Ar l4. On edge of more obvious impacted area. Small mounds around = sand pile

TP-160A 1125
4-6" black lens w/ orange middle - probably contaminated

- Native gravels below - pit dug to 3+ feet. No sample collected.

TP-161
On mound on east-side of east arm. Veg = poor - Dist Str. Ags m, Br te, some aspen sprigs. Looks like g l bar but?

TP-161A 1140
0-6" composite. Darke brown sandy Loam. Some visible dark lenses but not obvious Mn layer.

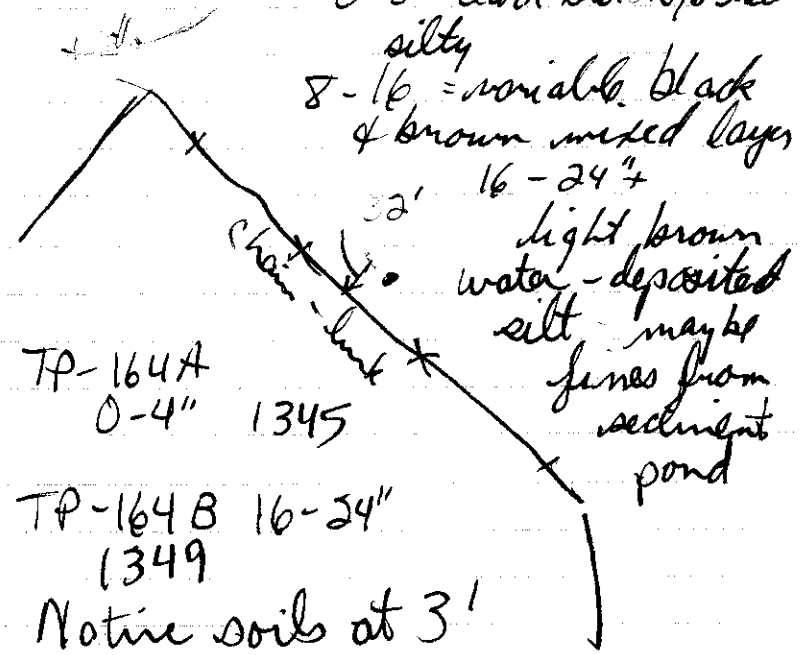
TP-162A 1154
0-2" dark brown surface layer - below = light brown sand w/ some small gravels.

TP-162B 30-42"
clay layer on top of old buried soil - light brown/yellow clay to cl

TP-163A 1230
0-6
Native soil - no obvious
contamination.
Ve = Syn Alb, Agsm,

TP-165
On small hill by bank wire
& chain-link fence.
Veg = mostly Ags, bad soil
plants & rocks
TP-165A 4-6" 1402

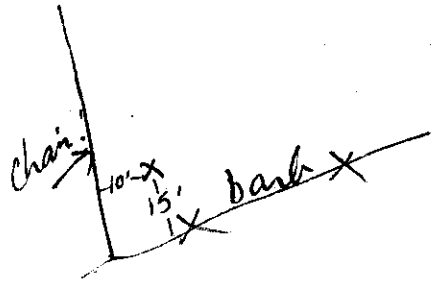
TP-164
- Open area - Saltgrass = 100%



0-8 - dark brown/black silty
8-16 = variable black & brown mixed layers
16-24"+ light brown water-deposited silt, maybe fines from sediment pond

TP-164A
0-4" 1345

TP-164B 16-24"
1349
Native soils at 3'



TP-166
By wooden bench at SE end of east arm

8-10" black

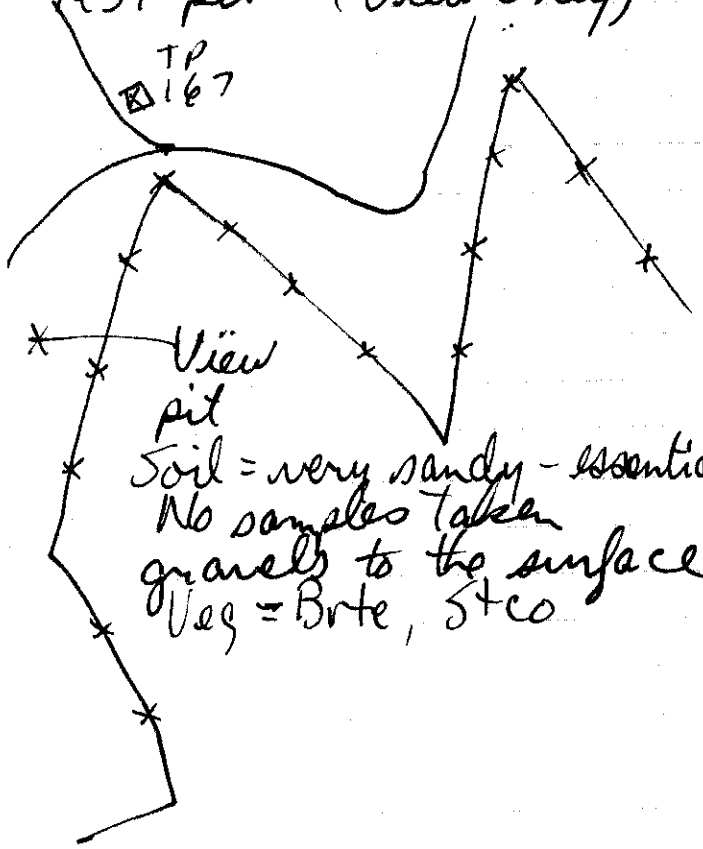
TP-166A	1420	0-4"
TP-166B	1425	12-18"

TP-167 At fork in path

Veg on surface = Dist Str. Tufted hairgrass willows
Some mill tailings (stringers) from 15-17". Sample collected from 14-20"
Black tails all around
TP-167A 14-20" 1445
TP-167B 22-24" 1450

Black tails from 0-20"
Below are tan sands with lots of cobbles
1450 - TP-167B 22-24"

Test pit - (View only)



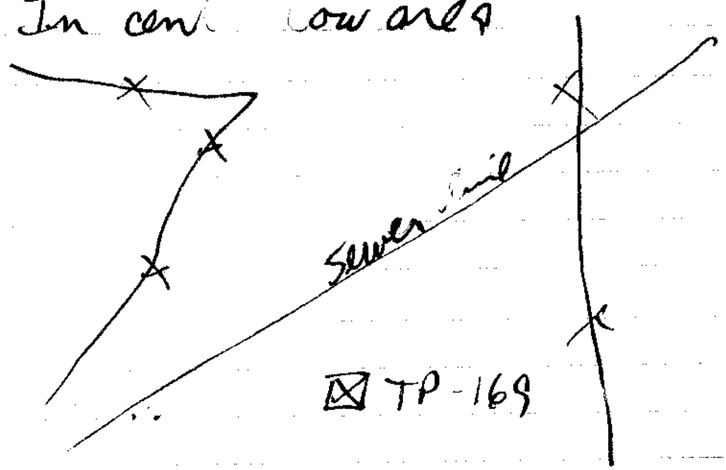
Soil = very sandy - essentially
No samples taken
gravels to the surface
Veg = Brte, Stco

TP-168A 2-6" 1525
Black (possibly asphalt) in far SE corner of chain-link compound.
Fine sand on top = poor veg
Knapweed, babysbreath, Brte.

TP-168B 1530 18-24"
Med to coarse-grained silica sand. below black

TP-168C 1545 3-5'
tan bedded silts & c[illegible]ys
[illegible] [illegible] lines [illegible] [illegible]m 5 & 6 [illegible]
days, but ?

TP-169
In cen[illegible] [illegible]ow area



0-6' Dark br/black sandy loam
[illegible] me coarse frag - not fine
Mn tails

6-18 - bedded dark brown/light brown sandy loam/loamy sand
emplaced - not native
18"-54" light brown sandy fill.
Native gravels at 4.5-5'

TP-169A 1555 0-6"
TP-169B 1600 6-18"

4-19-05 Tuesday overcast

0830 on-site SML, waiting for FWP to open gate to Wildlife Rehab ctr.

0915 Gate open

0930 Begin excavation in center of lot between stone buildings FWP wildlife rehab. ctr.

TP-170

170A - 9:47 4-6"
- light tan to brown unsorted sandy rounded to subrounded sands & gravel fill material

170B - 950 20-28" - dark black waste material, coarse angular gravelly sand and possible metal waste - gray ashy flecks

170C 951 32-38" - tan/brown gravelly clay and sand - no visible staining - looks like native material - no yellow/green wet mill tailings noted in excavation.

TP-171

171A 1012 -12"
- yellow/brown fn grained, processed (crushed) possible mill tailings sandy yellow orange Fe oxide stained

171B 1014 12-20"
- dark black fn. grained metallic conc., moist gravelly + sandy

171C 1017 30-36"
- tan to light brown clayey silty homogeneous native fill

TP172 - 20' west of powder magazine building
- 172A 1035 18-20"
- composite of native sand & gravel

TP173 - gas line exposed (!)

173A 1100 0-9"
- dk brown & black w/ blue sheen angular to subrounded silica gravel
- possible asphalt or other hydrocarbon

173B 1102 10-20"
- black to org/brn Fe ox stained stained possible metallics

173C 1104 22-24"
- native clays & sand - silt

4-19-05

TP 174 - At NW corner of Stidman Foundry building

174A 1136 0-8"
- gray/black angular cobbles & sand, flyash native sand etc.

174B 1140 14-16"
- light tan to brown well sorted sands and clays - no staining or dark materials

174C 1143 18-20"
- gray/black to dark black sandy cherred foundry sand and associated waste

174D 1144 30-32"
- tan to orange/brown FeOx stained clays and sand.

SPRING MEADOW LAKE

4/21/05 (Thurs). Left office @ 9am - went to Old Armory Bldg to pick up the boat + oars from DEQ. Hitch was padlocked - worked w/ Dale Horbart (sp?) to track down the keys. Went to Rock Hand for equipment while DEQ person went to metcalf Bldg for keys. Returned & loaded up the boat. Returned to office for cooler. Got boat in H_2O @ 10:30 AM. Cloudy; no wind; → 40°F. Faubion + Allewalt

10:45 : Sediment sample retrieved from SD-201 site (location on map). Sample is the 1st site on East Arm → the most Southern location on E arm. Obtained sample w/ Ponar Dredge. ~2ft of H_2O. Dark black organic silt.

11:02 : Sediment sample retrieved from SD-202 site. N of SD-201 in East Arm. 2ft of H_2O. Taken w/ Ponar Dredge. Dark black ~~thick~~ organic silt/clay.

11:15 : Sediment sample retrieved from SD-203 site. N of SD-202 where E arm opens after a tight narrow. 4ft of water. Tan/greenish sandy silt w/ some organic mud. Ponar dredge.

11:25 : Surface water sample retrieved. SW-201 N of SD-203. (see map) Filled bottles (2-1 for field parameters + 1 for dissolved metals) @ surface. Capped + in cooler. →

4/21/05 cont. SML

11:35: Retrieved sediment sample SD-204. N of SW-201. Ponar dredge. Sandy green + black silt. 3ft water depth.

11:40: Retrieved SD-205. Ponar. black organic silt. 2ft H_2O → N of SD-205 by footbridge.

11:45: Retrieved sediment sample SD206. Sandy tan/green w/ black organics. 6 ft water depth. NW of SD-205 (around bend).

12:00pm: Surface water sample taken. Filled bottles @ surface (2). SW-202.

12:08: Sediment sample retrieved SD-207. 3ft of water. Ponar dredge. S portion of main lake (N of Stedman bldgs; edge of lake) c black organic sand/silt.

12:12: Sediment sample retrieved SD-208. 2ft of water. Ponar dredge. W of SD-207. Black sandy silt.

12:45pm Surface water sample collected SW-203. S end of E arm (S of SD-201). 2 bottles filled.

1:15 - head back to return boat

2:00 - Return to SML to MW-202 to bail for sampling. Bail H_2O is muddy. Continued development w/ submersible pump. 29.9 T.D. 25" SU 13.3 SWL

2:10 -

	7 gallons purged	9 gallons purged
temp	10.97°C	10.99°C
cond	0.407 mS/cm	0.410/0.560 mS/cm
DO	67.9% (7.45 mg/L)	69.0% (7.54 mg/L)
pH	7.46	pH 7.42
ORP	203.6	ORP 203.7
~~turbidity~~		<100 turbidity

12 gallons purged

temp 10.97°C mS/cm

conduct .561/.410 → specific

DO (64.4% (7.07 mg/L)

pH 7.45

ORP 201.9

14:20pm sampled: clear H_2O 2 bottles filled (1 for field parameters; 1 for dissolved metals) 14:22

* 14:20 ending parameters: 10.96°C; cond. .560/.410 mS/cm; 62.8% DO (6.89 mg/L) pH 7.44; ORP 199.8 sample

4/21/05 SML Cont.

14:35 : drove to other mw to sample.

MW-01 : used Submersible pump and continue dvlpmt B4 sampling

7g purged 14:52

temp 7.03°C

Cond .557 mS/cm . 366 mS/cm (specific)

DO 25.9% (2.99 mg/L)

pH 7.76

ORP 55.1

15g purged 15:08

temp 7.3°C

Cond .555 . 367

DO 22.1% (2.68 mg/L)

pH 7.7

ORP -119.

10g purged 14:58

temp 7.2°C

Cond .555 mS/cm . 367 mS/c

DO 22.2% (2.66 mg/L)

pH 7.72

ORP -43.3

T.D. 32.55 23.18 SWL

SU 2.1

15:15 - GW sample field parameters bottle filled

15:17 - GW sample dissolved metals bottle filled.

Spring Meadow Site
Field Notes: June 24, 2005
Bug and Sediment Samplling

RE: Spring Meadow Project File

FIELD NOTES: Sampling June 24, 2005. John Koerth (DEQ) and Don Skaar (FWP Pollution Biologist). Warm sunny day.

Left DEQ LCG building at 12:30 pm with Don Skaar to collect co-located sediment and aquatic insect samples to determine biological uptake of arsenic and other metals from sediment in Spring Meadow Lake State Park. Took TMDL aluminum jon-boat from DEQ to lake for use in sampling effort. Lots of people out swimming and fishing in Spring Meadow Lake, FWP Park Employees on site.

Collected three samples. Bugs collected with net, Sediment with bucket auger. Bucket auger filled and brought to surface. Sediment from top of auger bucket pushed out and collected in sample jar.

1:30 PM SML 301 SD and 301 Bugs. Sample located at point on eastern arm where single narrow waterway separates the southern most portion of the eastern arm from the rest of the eastern arm. 3 feet of water, shade, willows. Dragon Fly nymphs plentiful. Don Skaar took GPS reading of location.

2:30 PM SML 302 SD and 302 Bugs. Sample located at southern most end of eastern arm approximately 30 feet from shore. Don Skaar took GPS reading for location. 2 feet of water, limited shade. Sedges. Dragon Fly nymphs less plentiful. Damsel Fly more common.

3:30 PM SML 303 SD and 303 Bugs. Sample location between first two locations at narrow channel with shade and brush. 3 feet of water, shade, willows. Don Skaar took GPS reading of location. Dragon Fly nymphs plentiful. Other aquatic insects less common.

Left site at 4:10. Returned to DEQ. Don Skaar to submit samples to the State Laboratory for analysis. DEQ to pay invoice.

Bugs and sediment to be sampled for: Sb, As, Ba, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Ag, Zn. (existing sediment data for these elements).

APPENDIX 5-B

RECLAMATION INVESTIGATION ANALYTICAL DATA

NORTHERN
Analytical Laboratories, Inc.

602 South 25th Street
P O Box 30315
Billings, MT 59101
Telephone: (406) 254-7226
Fax: (406) 254-1389

REPORT TO: ATTN: JOHN KOERTH
MONTANA DEPT. OF ENVIRONMENTAL QUALITY
P.O. BOX 200901
HELENA, MT 59620-0901

DATE: May 12, 2005
JOB NUMBER: 90-933-14
PAGE: 1 of 70
INVOICE NO.: 5040193

REPORT OF: Soil Analysis – Spring Meadow Lake (SML) – S1129-30SMLSRI

CASE NARRATIVE:

On April 22, 2005 these soil samples (laboratory numbers 2005040193-1 through -54) were received in our laboratory for analysis. Tests were conducted in accordance with SW-846 *"Test Methods for Evaluating Solid Waste"*, 3rd Edition, updates I, II, IIA, IIB, III; American Society of Agronomy *"Methods of Soil Analysis"*; USDA Handbook No. 60, *"Diagnosis and Improvement of Saline and Alkali Solids"*; Western States Laboratory Proficiency Testing Program, *"Soil & Plant Analytical Methods"*; and *"Standard Methods for the Examination of Water and Wastewater"*, 18th Edition.

The results of the analysis are shown on the following pages. A < sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this were not quantifiable. Sample results are not corrected for analyte blank concentrations. Values in brackets are the quality control limits for the associated quality control test. RPD is the abbreviation for relative percent difference.

The condition of the samples upon receipt at the laboratory is noted on the attached sample receipt checklist. Chain of custody documentation is enclosed.

Footnotes used in this report include the following:
J – The associated value is an estimated quantity.
(2) The recovery of the matrix spike is outside the stated quality control limit. However, the sample result was greater than four times the spike added; therefore no corrective action was required.
(4) The recovery of this analyte in the matrix spike and/or its spike duplicate did not meet the quality control limits. The recovery of the analyte in the laboratory control sample met the control limits. This indicates the presence of a matrix interference in the sample. The associated sample results have been footnoted with a data qualifier.
(6) The recovery or replication is outside the stated control limit. The associated sample results have been footnoted with a data qualifier.

Reviewed by _____
Kathleen A. Smit - Laboratory Manager

Cc: Attn: Ed Surbrugg
Tetra Tech EMI
7 West 6th Ave.; Suite 612
Helena, MT 59601

Attachments: Chain of Custody (5)
Sample Receipt Checklist

nct

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-1 **Description:** TP-151 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	219	mg/kg	6010B	04/28/2005
Barium Dry Basis	112	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	12	mg/kg	6010B	04/28/2005
Copper Dry Basis	29	mg/kg	6010B	04/28/2005
Iron Dry Basis	18,300	mg/kg	6010B	05/02/2005
Lead Dry Basis	154	mg/kg	6010B	04/28/2005
Manganese Dry Basis	3750	mg/kg	6010B	05/02/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	6	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	356	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-2 **Description:** TP-152 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	54	mg/kg	6010B	05/02/2005
Barium Dry Basis	56	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<10	mg/kg	6010B	05/02/2005
Chromium Dry Basis	74	mg/kg	6010B	04/28/2005
Copper Dry Basis	17	mg/kg	6010B	04/28/2005
Iron Dry Basis	94,400	mg/kg	6010B	05/02/2005
Lead Dry Basis	140	mg/kg	6010B	04/28/2005
Manganese Dry Basis	2240	mg/kg	6010B	05/02/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	9	mg/kg	6010B	04/28/2005
Silver Dry Basis	<25	mg/kg	6010B	05/02/2005
Zinc Dry Basis	81	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-3 **Description:** TP-153A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	329	mg/kg	6010B	04/28/2005
Barium Dry Basis	102	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	3	mg/kg	6010B	04/28/2005
Chromium Dry Basis	26	mg/kg	6010B	04/28/2005
Copper Dry Basis	45	mg/kg	6010B	04/28/2005
Iron Dry Basis	33,200	mg/kg	6010B	05/02/2005
Lead Dry Basis	247	mg/kg	6010B	04/28/2005
Manganese Dry Basis	4620	mg/kg	6010B	05/02/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	8	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	345	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-4 **Description:** TP-153B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	<50	mg/kg	6010B	05/02/2005
Barium Dry Basis	71	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<10	mg/kg	6010B	05/02/2005
Chromium Dry Basis	52	mg/kg	6010B	04/28/2005
Copper Dry Basis	18	mg/kg	6010B	04/28/2005
Iron Dry Basis	62,500	mg/kg	6010B	05/02/2005
Lead Dry Basis	89	mg/kg	6010B	04/28/2005
Manganese Dry Basis	1490	mg/kg	6010B	05/02/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	7	mg/kg	6010B	04/28/2005
Silver Dry Basis	<25	mg/kg	6010B	05/02/2005
Zinc Dry Basis	106	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-5 **Description:** TP-154A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	22	mg/kg	6020	05/03/2005
Arsenic Dry Basis	879	mg/kg	6010B	04/28/2005
Barium Dry Basis	264	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	8	mg/kg	6010B	04/28/2005
Chromium Dry Basis	31	mg/kg	6010B	04/28/2005
Copper Dry Basis	144	mg/kg	6010B	04/28/2005
Iron Dry Basis	25,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	998	mg/kg	6010B	04/28/2005
Manganese Dry Basis	41,400	mg/kg	6010B	05/02/2005
Mercury Dry Basis	0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	8	mg/kg	6010B	04/28/2005
Silver Dry Basis	14	mg/kg	6010B	04/28/2005
Zinc Dry Basis	1460	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-6 **Description:** TP-154B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	44	mg/kg	6010B	04/28/2005
Barium Dry Basis	31	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	10	mg/kg	6010B	04/28/2005
Copper Dry Basis	15	mg/kg	6010B	04/28/2005
Iron Dry Basis	14,200	mg/kg	6010B	05/02/2005
Lead Dry Basis	72	mg/kg	6010B	04/28/2005
Manganese Dry Basis	446	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	77	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-7 **Description:** TP-155A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	17	mg/kg	6020	05/03/2005
Arsenic Dry Basis	434	mg/kg	6010B	04/28/2005
Barium Dry Basis	289	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	5	mg/kg	6010B	04/28/2005
Chromium Dry Basis	33	mg/kg	6010B	04/28/2005
Copper Dry Basis	126	mg/kg	6010B	04/28/2005
Iron Dry Basis	20,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	677	mg/kg	6010B	04/28/2005
Manganese Dry Basis	41,700	mg/kg	6010B	05/02/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	6	mg/kg	6010B	04/28/2005
Silver Dry Basis	12	mg/kg	6010B	04/28/2005
Zinc Dry Basis	1260	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-8 **Description:** TP-155B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	37	mg/kg	6010B	04/28/2005
Barium Dry Basis	80	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	16	mg/kg	6010B	04/28/2005
Copper Dry Basis	24	mg/kg	6010B	04/28/2005
Iron Dry Basis	21,100	mg/kg	6010B	05/02/2005
Lead Dry Basis	75	mg/kg	6010B	04/28/2005
Manganese Dry Basis	425	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	10	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	87	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-10 **Description:** TP-156B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	114	mg/kg	3c MOD	04/29/2005
Hardness as CaCO3	2600	mg/l	2340B	05/13/2005
Cation Exchange Capacity	16.4	meq/100g	19 ASA	05/12/2005
Electrical Conductivity Saturated Paste	4.22	mmhos/cm	3a	04/29/2005
pH Saturated Paste	7.5	S.U.	21(a) ASA	04/29/2005
Calcium saturated paste	21.9	meq/l	6010B	05/13/2005
Magnesium saturated paste	30.1	meq/l	6010B	05/13/2005
Sulfate Water Soluble Dry Basis	0.26	%	10-3.7MOD	04/29/2005
PARTICLE SIZE ANALYSIS				
Sand	51.3	%	42b mod.	05/03/2005
Silt	31.2	%	42b mod.	05/03/2005
Clay	17.5	%	42b mod.	05/03/2005
Texture	Loam		42b mod.	05/03/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	9	mg/kg	6020	05/03/2005
Arsenic Dry Basis	624	mg/kg	6010B	04/28/2005
Barium Dry Basis	224	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	6	mg/kg	6010B	04/28/2005
Chromium Dry Basis	12	mg/kg	6010B	04/28/2005
Copper Dry Basis	77	mg/kg	6010B	04/28/2005
Iron Dry Basis	18,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	572	mg/kg	6010B	04/28/2005
Manganese Dry Basis	5340	mg/kg	6010B	05/02/2005
Mercury Dry Basis	0.6	mg/kg	6020A	05/02/2005
Nickel Dry Basis	8	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	908	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-9 **Description:** TP-156A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	101	mg/kg	6010B	04/28/2005
Barium Dry Basis	85	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	11	mg/kg	6010B	04/28/2005
Copper Dry Basis	35	mg/kg	6010B	04/28/2005
Iron Dry Basis	17,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	83	mg/kg	6010B	04/28/2005
Manganese Dry Basis	1070	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	8	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	116	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-11 **Description:** TP-157A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	180	mg/kg	6010B	04/28/2005
Barium Dry Basis	149	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	3	mg/kg	6010B	04/28/2005
Chromium Dry Basis	11	mg/kg	6010B	04/28/2005
Copper Dry Basis	37	mg/kg	6010B	04/28/2005
Iron Dry Basis	16,600	mg/kg	6010B	05/02/2005
Lead Dry Basis	146	mg/kg	6010B	04/28/2005
Manganese Dry Basis	3030	mg/kg	6010B	05/02/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	10	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	530	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-12 **Description:** TP-157B **Matrix:** SOIL
Date Received: 04/22/2005
Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	<20	mg/kg	3c MOD	04/29/2005
Hardness as CaCO3	217	mg/l	2340B	05/13/2005
Cation Exchange Capacity	11.9	meq/100g	19 ASA	05/12/2005
Electrical Conductivity Saturated Paste	0.34	mmhos/cm	3a	04/29/2005
pH Saturated Paste	7.8	S.U.	21(a) ASA	04/29/2005
Calcium saturated paste	3.34	meq/l	6010B	05/13/2005
Magnesium saturated paste	0.99	meq/l	6010B	05/13/2005
Sulfate Water Soluble Dry Basis	<0.01	%	10-3.7MOD	04/29/2005
PARTICLE SIZE ANALYSIS				
Sand	43.8	%	42b mod.	05/03/2005
Silt	36.2	%	42b mod.	05/03/2005
Clay	20.0	%	42b mod.	05/03/2005
Texture	Loam		42b mod.	05/03/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	45	mg/kg	6010B	04/28/2005
Barium Dry Basis	133	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	13	mg/kg	6010B	04/28/2005
Copper Dry Basis	20	mg/kg	6010B	04/28/2005
Iron Dry Basis	17,700	mg/kg	6010B	05/02/2005
Lead Dry Basis	37	mg/kg	6010B	04/28/2005
Manganese Dry Basis	292	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	9	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	62	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-13 **Description:** TP-158A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	22	mg/kg	6020	05/03/2005
Arsenic Dry Basis	1460	mg/kg	6010B	04/28/2005
Barium Dry Basis	422	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	17	mg/kg	6010B	04/28/2005
Chromium Dry Basis	35	mg/kg	6010B	04/28/2005
Copper Dry Basis	218	mg/kg	6010B	04/28/2005
Iron Dry Basis	15,600	mg/kg	6010B	05/02/2005
Lead Dry Basis	1310	mg/kg	6010B	04/28/2005
Manganese Dry Basis	111,000	mg/kg	6010B	05/02/2005
Mercury Dry Basis	0.6	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	27	mg/kg	6010B	04/28/2005
Zinc Dry Basis	3380	mg/kg	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-14 **Description:** TP-158B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	24	mg/kg	3c MOD	04/29/2005
Hardness as CaCO3	203J	mg/l	2340B	05/06/2005
Cation Exchange Capacity	5.6	meq/100g	19 ASA	05/12/2005
Electrical Conductivity Saturated Paste	0.46	mmhos/cm	3a	04/29/2005
pH Saturated Paste	7.8	S.U.	21(a) ASA	04/29/2005
Calcium saturated paste	2.99J	meq/l	6010B	05/06/2005
Magnesium saturated paste	1.07J	meq/l	6010B	05/06/2005
Sulfate Water Soluble Dry Basis	<0.01	%	10-3.7MOD	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	62	mg/kg	6010B	04/28/2005
Barium Dry Basis	75	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	14	mg/kg	6010B	04/28/2005
Copper Dry Basis	24	mg/kg	6010B	04/28/2005
Iron Dry Basis	17,600	mg/kg	6010B	05/02/2005
Lead Dry Basis	76	mg/kg	6010B	04/28/2005
Manganese Dry Basis	1420	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	7	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	109	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-15 **Description:** TP-159A **Matrix:** SOIL
Date Received: 04/22/2005
Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	15	mg/kg	6020	05/03/2005
Arsenic Dry Basis	1290	mg/kg	6010B	04/28/2005
Barium Dry Basis	232	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	17	mg/kg	6010B	04/28/2005
Chromium Dry Basis	16	mg/kg	6010B	04/28/2005
Copper Dry Basis	123	mg/kg	6010B	04/28/2005
Iron Dry Basis	18,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	926	mg/kg	6010B	04/28/2005
Manganese Dry Basis	29,100	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	6	mg/kg	6010B	04/28/2005
Silver Dry Basis	13	mg/kg	6010B	04/28/2005
Zinc Dry Basis	2260	mg/kg	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-16 **Description:** TP-160A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	61	mg/kg	6020	05/03/2005
Arsenic Dry Basis	5400	mg/kg	6010B	05/02/2005
Barium Dry Basis	465	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	41	mg/kg	6010B	04/28/2005
Chromium Dry Basis	28	mg/kg	6010B	04/28/2005
Copper Dry Basis	377	mg/kg	6010B	04/28/2005
Iron Dry Basis	24,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	3330	mg/kg	6010B	04/28/2005
Manganese Dry Basis	85,500	mg/kg	6010B	04/28/2005
Mercury Dry Basis	0.9	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	50	mg/kg	6010B	04/28/2005
Zinc Dry Basis	5730	mg/kg	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-17 **Description:** TP-161A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	13	mg/kg	6020	05/03/2005
Arsenic Dry Basis	804	mg/kg	6010B	04/28/2005
Barium Dry Basis	106	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	8	mg/kg	6010B	04/28/2005
Chromium Dry Basis	14	mg/kg	6010B	04/28/2005
Copper Dry Basis	74	mg/kg	6010B	04/28/2005
Iron Dry Basis	17,400	mg/kg	6010B	05/02/2005
Lead Dry Basis	614	mg/kg	6010B	04/28/2005
Manganese Dry Basis	12,100	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	6	mg/kg	6010B	04/28/2005
Zinc Dry Basis	841	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-18 **Description:** TP-162A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	7	mg/kg	6020	05/03/2005
Arsenic Dry Basis	126	mg/kg	6010B	04/28/2005
Barium Dry Basis	150	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	16	mg/kg	6010B	04/28/2005
Copper Dry Basis	61	mg/kg	6010B	04/28/2005
Iron Dry Basis	18,600	mg/kg	6010B	05/02/2005
Lead Dry Basis	269	mg/kg	6010B	04/28/2005
Manganese Dry Basis	15,000	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	603	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-19 **Description:** TP-162B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	24	mg/kg	3c MOD	04/29/2005
Hardness as CaCO3	255	mg/l	2340B	05/13/2005
Cation Exchange Capacity	21.5	meq/100g	19 ASA	05/12/2005
Electrical Conductivity Saturated Paste	0.77	mmhos/cm	3a	04/29/2005
pH Saturated Paste	7.9	S.U.	21(a) ASA	04/29/2005
Calcium saturated paste	3.29	meq/l	6010B	05/13/2005
Magnesium saturated paste	1.81	meq/l	6010B	05/13/2005
Sulfate Water Soluble Dry Basis	<0.01	%	10-3.7MOD	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	100	mg/kg	6010B	04/28/2005
Barium Dry Basis	161	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	19	mg/kg	6010B	04/28/2005
Copper Dry Basis	73	mg/kg	6010B	04/28/2005
Iron Dry Basis	24,500	mg/kg	6010B	05/02/2005
Lead Dry Basis	115	mg/kg	6010B	04/28/2005
Manganese Dry Basis	1730	mg/kg	6010B	04/28/2005
Mercury Dry Basis	0.6	mg/kg	6020A	05/02/2005
Nickel Dry Basis	15	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	187	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-20 **Description:** TP-163A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	172	mg/kg	6010B	04/28/2005
Barium Dry Basis	155	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	11	mg/kg	6010B	04/28/2005
Copper Dry Basis	113	mg/kg	6010B	04/28/2005
Iron Dry Basis	19,400	mg/kg	6010B	05/02/2005
Lead Dry Basis	189	mg/kg	6010B	04/28/2005
Manganese Dry Basis	5220	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	10	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	274	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-21 **Description:** TP-164A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	23	mg/kg	6020	05/03/2005
Arsenic Dry Basis	754	mg/kg	6010B	04/28/2005
Barium Dry Basis	539	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	12	mg/kg	6010B	04/28/2005
Chromium Dry Basis	40	mg/kg	6010B	04/28/2005
Copper Dry Basis	241	mg/kg	6010B	04/28/2005
Iron Dry Basis	15,200	mg/kg	6010B	05/02/2005
Lead Dry Basis	1220	mg/kg	6010B	04/28/2005
Manganese Dry Basis	122,000	mg/kg	6010B	05/09/2005
Mercury Dry Basis	0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	30	mg/kg	6010B	04/28/2005
Zinc Dry Basis	2680	mg/kg	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-22 **Description:** TP-164B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	48	mg/kg	3c MOD	04/29/2005
Hardness as CaCO3	2000	mg/l	2340B	05/13/2005
Cation Exchange Capacity	18.3	meq/100g	19 ASA	05/12/2005
Electrical Conductivity Saturated Paste	2.62	mmhos/cm	3a	04/29/2005
pH Saturated Paste	7.6	S.U.	21(a) ASA	04/29/2005
Calcium saturated paste	24.8	meq/l	6010B	05/13/2005
Magnesium saturated paste	15.2	meq/l	6010B	05/13/2005
Sulfate Water Soluble Dry Basis	0.17	%	10-3.7MOD	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	6	mg/kg	6020	05/03/2005
Arsenic Dry Basis	461	mg/kg	6010B	04/28/2005
Barium Dry Basis	196	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	8	mg/kg	6010B	04/28/2005
Chromium Dry Basis	17	mg/kg	6010B	04/28/2005
Copper Dry Basis	104	mg/kg	6010B	04/28/2005
Iron Dry Basis	29,700	mg/kg	6010B	05/02/2005
Lead Dry Basis	373	mg/kg	6010B	04/28/2005
Manganese Dry Basis	4230	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	12	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	1260	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-23 **Description:** TP-165A **Matrix:** SOIL
Date Received: 04/22/2005
Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	6	mg/kg	6020	05/03/2005
Arsenic Dry Basis	502	mg/kg	6010B	04/28/2005
Barium Dry Basis	136	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	4	mg/kg	6010B	04/28/2005
Chromium Dry Basis	18	mg/kg	6010B	04/28/2005
Copper Dry Basis	66	mg/kg	6010B	04/28/2005
Iron Dry Basis	22,900	mg/kg	6010B	05/02/2005
Lead Dry Basis	389	mg/kg	6010B	04/28/2005
Manganese Dry Basis	12,200	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	6	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	566	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-24 **Description:** TP-166A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	12	mg/kg	6020	05/03/2005
Arsenic Dry Basis	570	mg/kg	6010B	04/28/2005
Barium Dry Basis	194	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	5	mg/kg	6010B	04/28/2005
Chromium Dry Basis	14	mg/kg	6010B	04/28/2005
Copper Dry Basis	102	mg/kg	6010B	04/28/2005
Iron Dry Basis	15,800	mg/kg	6010B	05/02/2005
Lead Dry Basis	537	mg/kg	6010B	04/28/2005
Manganese Dry Basis	27,900	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	8	mg/kg	6010B	04/28/2005
Zinc Dry Basis	1130	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-25 **Description:** TP-166B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	26	mg/kg	6010B	04/28/2005
Barium Dry Basis	44	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	5	mg/kg	6010B	04/28/2005
Copper Dry Basis	<10	mg/kg	6010B	04/28/2005
Iron Dry Basis	7840	mg/kg	6010B	04/28/2005
Lead Dry Basis	20	mg/kg	6010B	04/28/2005
Manganese Dry Basis	347	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	36	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-26 **Description:** TP-167A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	93	mg/kg	6020	05/03/2005
Arsenic Dry Basis	10,400	mg/kg	6010B	05/02/2005
Barium Dry Basis	494	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	13	mg/kg	6010B	04/28/2005
Chromium Dry Basis	18	mg/kg	6010B	04/28/2005
Copper Dry Basis	265	mg/kg	6010B	04/28/2005
Iron Dry Basis	22,400	mg/kg	6010B	05/02/2005
Lead Dry Basis	6180	mg/kg	6010B	05/02/2005
Manganese Dry Basis	53,200	mg/kg	6010B	04/28/2005
Mercury Dry Basis	0.6	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	54	mg/kg	6010B	04/28/2005
Zinc Dry Basis	2490	mg/kg	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-27 **Description:** TP-167B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	<20	mg/kg	3c MOD	04/29/2005
Hardness as CaCO3	135	mg/l	2340B	05/13/2005
Cation Exchange Capacity	5.0	meq/100g	19 ASA	05/12/2005
Electrical Conductivity Saturated Paste	0.31	mmhos/cm	3a	04/29/2005
pH Saturated Paste	8.1	S.U.	21(a) ASA	04/29/2005
Calcium saturated paste	2.05	meq/l	6010B	05/13/2005
Magnesium saturated paste	0.66	meq/l	6010B	05/13/2005
Sulfate Water Soluble Dry Basis	<0.01	%	10-3.7MOD	04/29/2005
PARTICLE SIZE ANALYSIS				
Sand	88.8	%	42b mod.	05/03/2005
Silt	8.7	%	42b mod.	05/03/2005
Clay	2.5	%	42b mod.	05/03/2005
Texture	Sand		42b mod.	05/03/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	101	mg/kg	6010B	04/28/2005
Barium Dry Basis	57	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	12	mg/kg	6010B	04/28/2005
Copper Dry Basis	25	mg/kg	6010B	04/28/2005
Iron Dry Basis	15,600	mg/kg	6010B	05/02/2005
Lead Dry Basis	82	mg/kg	6010B	04/28/2005
Manganese Dry Basis	1210	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	97	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-28 **Description:** TP-168A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	37	mg/kg	6010B	04/28/2005
Barium Dry Basis	50	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	11	mg/kg	6010B	04/28/2005
Copper Dry Basis	19	mg/kg	6010B	04/28/2005
Iron Dry Basis	15,600	mg/kg	6010B	05/02/2005
Lead Dry Basis	37	mg/kg	6010B	04/28/2005
Manganese Dry Basis	338	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	8	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	62	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-29 **Description:** TP-168B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	21	mg/kg	6010B	04/28/2005
Barium Dry Basis	58	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	8	mg/kg	6010B	04/28/2005
Copper Dry Basis	12	mg/kg	6010B	04/28/2005
Iron Dry Basis	13,200	mg/kg	6010B	05/02/2005
Lead Dry Basis	30	mg/kg	6010B	04/28/2005
Manganese Dry Basis	644	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	48	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-30 **Description:** TP-168C **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	110	mg/kg	6010B	04/28/2005
Barium Dry Basis	123	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	13	mg/kg	6010B	04/28/2005
Copper Dry Basis	49	mg/kg	6010B	04/28/2005
Iron Dry Basis	21,500	mg/kg	6010B	05/02/2005
Lead Dry Basis	108	mg/kg	6010B	04/28/2005
Manganese Dry Basis	1030	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	10	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	136	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-31 **Description:** TP-169A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	11	mg/kg	6020	05/03/2005
Arsenic Dry Basis	781	mg/kg	6010B	04/28/2005
Barium Dry Basis	202	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	6	mg/kg	6010B	04/28/2005
Chromium Dry Basis	13	mg/kg	6010B	04/28/2005
Copper Dry Basis	103	mg/kg	6010B	04/28/2005
Iron Dry Basis	19,100	mg/kg	6010B	05/02/2005
Lead Dry Basis	590	mg/kg	6010B	04/28/2005
Manganese Dry Basis	24,700	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	7	mg/kg	6010B	04/28/2005
Silver Dry Basis	7	mg/kg	6010B	04/28/2005
Zinc Dry Basis	1050	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-32 **Description:** TP-169B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	<20	mg/kg	3c MOD	04/29/2005
Hardness as CaCO3	162J	mg/l	2340B	05/13/2005
Cation Exchange Capacity	7.8	meq/100g	19 ASA	05/12/2005
Electrical Conductivity Saturated Paste	0.34	mmhos/cm	3a	04/29/2005
pH Saturated Paste	7.9	S.U.	21(a) ASA	04/29/2005
Calcium saturated paste	2.25J	meq/l	6010B	05/13/2005
Magnesium saturated paste	0.99J	meq/l	6010B	05/13/2005
Sulfate Water Soluble Dry Basis	<0.01	%	10-3.7MOD	04/29/2005
PARTICLE SIZE ANALYSIS				
Sand	67.5	%	42b mod.	05/03/2005
Silt	23.7	%	42b mod.	05/03/2005
Clay	8.8	%	42b mod.	05/03/2005
Texture	Sandy Loam		42b mod.	05/03/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	10	mg/kg	6020	05/03/2005
Arsenic Dry Basis	609	mg/kg	6010B	04/28/2005
Barium Dry Basis	200	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	5	mg/kg	6010B	04/28/2005
Chromium Dry Basis	15	mg/kg	6010B	04/28/2005
Copper Dry Basis	92	mg/kg	6010B	04/28/2005
Iron Dry Basis	21,300	mg/kg	6010B	05/02/2005
Lead Dry Basis	496	mg/kg	6010B	04/28/2005
Manganese Dry Basis	22,800	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	7	mg/kg	6010B	04/28/2005
Silver Dry Basis	5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	911	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-33 **Description:** TP-170A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	<10	mg/kg	6010B	04/28/2005
Barium Dry Basis	46	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	13	mg/kg	6010B	04/28/2005
Copper Dry Basis	19	mg/kg	6010B	04/28/2005
Iron Dry Basis	16,300	mg/kg	6010B	05/02/2005
Lead Dry Basis	18	mg/kg	6010B	04/28/2005
Manganese Dry Basis	340	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	7	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	52	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-34 **Description:** TP-170B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	47	mg/kg	6020	05/03/2005
Arsenic Dry Basis	<50	mg/kg	6010B	05/02/2005
Barium Dry Basis	78	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<10	mg/kg	6010B	05/02/2005
Chromium Dry Basis	32	mg/kg	6010B	04/28/2005
Copper Dry Basis	99	mg/kg	6010B	04/28/2005
Iron Dry Basis	103,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	567	mg/kg	6010B	04/28/2005
Manganese Dry Basis	952	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	22	mg/kg	6010B	04/28/2005
Silver Dry Basis	<25	mg/kg	6010B	05/02/2005
Zinc Dry Basis	78	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-35 **Description:** TP-170C **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	61	mg/kg	6010B	04/28/2005
Barium Dry Basis	140	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	10	mg/kg	6010B	04/28/2005
Copper Dry Basis	29	mg/kg	6010B	04/28/2005
Iron Dry Basis	14,900	mg/kg	6010B	05/02/2005
Lead Dry Basis	60	mg/kg	6010B	04/28/2005
Manganese Dry Basis	444	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	7	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	83	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-36 **Description:** TP-171A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	280	mg/kg	6020	05/03/2005
Arsenic Dry Basis	33,700	mg/kg	6010B	05/02/2005
Barium Dry Basis	581	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	78	mg/kg	6010B	05/02/2005
Chromium Dry Basis	17	mg/kg	6010B	04/28/2005
Copper Dry Basis	1290	mg/kg	6010B	04/28/2005
Iron Dry Basis	61,200	mg/kg	6010B	05/02/2005
Lead Dry Basis	16,300	mg/kg	6010B	05/02/2005
Manganese Dry Basis	60,000	mg/kg	6010B	04/28/2005
Mercury Dry Basis	2.1	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	106	mg/kg	6010B	05/02/2005
Zinc Dry Basis	5940	mg/kg	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-37 **Description:** TP-171B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	59	mg/kg	6010B	05/02/2005
Barium Dry Basis	98	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<10	mg/kg	6010B	05/02/2005
Chromium Dry Basis	21	mg/kg	6010B	04/28/2005
Copper Dry Basis	46	mg/kg	6010B	04/28/2005
Iron Dry Basis	71,900	mg/kg	6010B	05/02/2005
Lead Dry Basis	60	mg/kg	6010B	04/28/2005
Manganese Dry Basis	1260	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	17	mg/kg	6010B	04/28/2005
Silver Dry Basis	<25	mg/kg	6010B	05/02/2005
Zinc Dry Basis	92	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-38 **Description:** TP-171C **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	43	mg/kg	6010B	04/28/2005
Barium Dry Basis	142	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	12	mg/kg	6010B	04/28/2005
Copper Dry Basis	24	mg/kg	6010B	04/28/2005
Iron Dry Basis	16,400	mg/kg	6010B	05/02/2005
Lead Dry Basis	31	mg/kg	6010B	04/28/2005
Manganese Dry Basis	305	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	9	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	53	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-39 **Description:** TP-172A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	30	mg/kg	6010B	04/28/2005
Barium Dry Basis	64	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	10	mg/kg	6010B	04/28/2005
Copper Dry Basis	21	mg/kg	6010B	04/28/2005
Iron Dry Basis	15,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	52	mg/kg	6010B	04/28/2005
Manganese Dry Basis	333	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	6	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	76	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-40 **Description:** TP-173A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	9	mg/kg	6020	05/03/2005
Arsenic Dry Basis	158	mg/kg	6010B	04/28/2005
Barium Dry Basis	773	mg/kg	6010B	04/28/2005
Cadmium Dry Basis	14	mg/kg	6010B	04/28/2005
Chromium Dry Basis	48	mg/kg	6010B	04/28/2005
Copper Dry Basis	350	mg/kg	6010B	04/28/2005
Iron Dry Basis	18,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	1290	mg/kg	6010B	04/28/2005
Manganese Dry Basis	224,000	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	31	mg/kg	6010B	04/28/2005
Zinc Dry Basis	3370	mg/kg	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-41 **Description:** TP-173B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	21	mg/kg	6020	05/03/2005
Arsenic Dry Basis	1240	mg/kg	6010B	04/28/2005
Barium Dry Basis	343	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	264	mg/kg	6010B	04/28/2005
Chromium Dry Basis	24	mg/kg	6010B	04/28/2005
Copper Dry Basis	253	mg/kg	6010B	05/03/2005
Iron Dry Basis	53,100	mg/kg	6010B	05/02/2005
Lead Dry Basis	3010	mg/kg	6010B	04/28/2005
Manganese Dry Basis	36,900	mg/kg	6010B	04/28/2005
Mercury Dry Basis	0.7	mg/kg	6020A	05/02/2005
Nickel Dry Basis	11	mg/kg	6010B	04/28/2005
Silver Dry Basis	15	mg/kg	6010B	04/28/2005
Zinc Dry Basis	48,400	mg/kg	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-42 **Description:** TP-173C **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	54	mg/kg	6010B	04/28/2005
Barium Dry Basis	172	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	10	mg/kg	6010B	04/28/2005
Copper Dry Basis	22	mg/kg	6010B	05/03/2005
Iron Dry Basis	15,000	mg/kg	6010B	05/02/2005
Lead Dry Basis	27	mg/kg	6010B	04/28/2005
Manganese Dry Basis	448	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	9	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	93	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-43 **Description:** TP-174A **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	76	mg/kg	6010B	04/28/2005
Barium Dry Basis	180	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	4	mg/kg	6010B	04/28/2005
Chromium Dry Basis	17	mg/kg	6010B	04/28/2005
Copper Dry Basis	53	mg/kg	6010B	05/03/2005
Iron Dry Basis	19,300	mg/kg	6010B	05/02/2005
Lead Dry Basis	298	mg/kg	6010B	04/28/2005
Manganese Dry Basis	18,000	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	9	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	1050	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-44 **Description:** TP-174B **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	65	mg/kg	6010B	04/28/2005
Barium Dry Basis	79	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	11	mg/kg	6010B	04/28/2005
Copper Dry Basis	24	mg/kg	6010B	05/03/2005
Iron Dry Basis	17,800	mg/kg	6010B	05/02/2005
Lead Dry Basis	55	mg/kg	6010B	04/28/2005
Manganese Dry Basis	391	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	8	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	80	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-45 **Description:** TP-174C **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	11	mg/kg	6010B	04/28/2005
Barium Dry Basis	79	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	10	mg/kg	6010B	04/28/2005
Copper Dry Basis	65	mg/kg	6010B	05/03/2005
Iron Dry Basis	32,600	mg/kg	6010B	05/02/2005
Lead Dry Basis	84	mg/kg	6010B	04/28/2005
Manganese Dry Basis	396	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	12	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	69	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-46 **Description:** TP-174D **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	39	mg/kg	6010B	04/28/2005
Barium Dry Basis	127	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	13	mg/kg	6010B	04/28/2005
Copper Dry Basis	22	mg/kg	6010B	05/03/2005
Iron Dry Basis	18,200	mg/kg	6010B	05/02/2005
Lead Dry Basis	33	mg/kg	6010B	04/28/2005
Manganese Dry Basis	407	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	9	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	89	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-47 **Description:** SD-201 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	2.0 J	%	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	95	mg/kg	6010B	04/28/2005
Barium Dry Basis	77	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	8	mg/kg	6010B	04/28/2005
Copper Dry Basis	25	mg/kg	6010B	05/03/2005
Iron Dry Basis	10,800	mg/kg	6010B	05/02/2005
Lead Dry Basis	135	mg/kg	6010B	04/28/2005
Manganese Dry Basis	3650	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	198	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-48 **Description:** SD-202 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	1.6	%	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	34	mg/kg	6010B	04/28/2005
Barium Dry Basis	54	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	7	mg/kg	6010B	04/28/2005
Copper Dry Basis	19	mg/kg	6010B	05/03/2005
Iron Dry Basis	9550	mg/kg	6010B	04/28/2005
Lead Dry Basis	53	mg/kg	6010B	04/28/2005
Manganese Dry Basis	384	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	83	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-49 **Description:** SD-203 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	1.4	%	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	19	mg/kg	6010B	04/28/2005
Barium Dry Basis	52	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	10	mg/kg	6010B	04/28/2005
Copper Dry Basis	15	mg/kg	6010B	05/03/2005
Iron Dry Basis	9840	mg/kg	6010B	04/28/2005
Lead Dry Basis	64	mg/kg	6010B	04/28/2005
Manganese Dry Basis	159	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	82	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-50 **Description:** SD-204 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	2.8	%	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	32	mg/kg	6010B	04/28/2005
Barium Dry Basis	116	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	10	mg/kg	6010B	04/28/2005
Copper Dry Basis	42	mg/kg	6010B	05/03/2005
Iron Dry Basis	9560	mg/kg	6010B	04/28/2005
Lead Dry Basis	163	mg/kg	6010B	04/28/2005
Manganese Dry Basis	586	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	218	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-51 **Description:** SD-205 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	3.3	%	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	31	mg/kg	6010B	04/28/2005
Barium Dry Basis	120	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	10	mg/kg	6010B	04/28/2005
Copper Dry Basis	38	mg/kg	6010B	05/03/2005
Iron Dry Basis	14,300	mg/kg	6010B	05/02/2005
Lead Dry Basis	130	mg/kg	6010B	04/28/2005
Manganese Dry Basis	323	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	7	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	185	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-52 **Description:** SD-206 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	2.6	%	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	20	mg/kg	6010B	04/28/2005
Barium Dry Basis	98	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	6	mg/kg	6010B	04/28/2005
Copper Dry Basis	24	mg/kg	6010B	05/03/2005
Iron Dry Basis	6420	mg/kg	6010B	04/28/2005
Lead Dry Basis	70	mg/kg	6010B	04/28/2005
Manganese Dry Basis	173	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	93	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-53 **Description:** SD-207 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	9.2	%	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	105	mg/kg	6010B	04/28/2005
Barium Dry Basis	121	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	<2	mg/kg	6010B	04/28/2005
Chromium Dry Basis	5	mg/kg	6010B	04/28/2005
Copper Dry Basis	39	mg/kg	6010B	05/03/2005
Iron Dry Basis	6940	mg/kg	6010B	04/28/2005
Lead Dry Basis	70	mg/kg	6010B	04/28/2005
Manganese Dry Basis	814	mg/kg	6010B	04/28/2005
Mercury Dry Basis	<0.5	mg/kg	6020A	05/02/2005
Nickel Dry Basis	<5	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	314	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-54 **Description:** SD-208 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	5.0	%	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<5	mg/kg	6020	05/03/2005
Arsenic Dry Basis	110	mg/kg	6010B	04/28/2005
Barium Dry Basis	130	mg/kg	6010B	05/03/2005
Cadmium Dry Basis	6	mg/kg	6010B	04/28/2005
Chromium Dry Basis	13	mg/kg	6010B	04/28/2005
Copper Dry Basis	78	mg/kg	6010B	05/03/2005
Iron Dry Basis	14,800	mg/kg	6010B	05/02/2005
Lead Dry Basis	319	mg/kg	6010B	04/28/2005
Manganese Dry Basis	1370	mg/kg	6010B	04/28/2005
Mercury Dry Basis	0.6	mg/kg	6020A	05/02/2005
Nickel Dry Basis	7	mg/kg	6010B	04/28/2005
Silver Dry Basis	<5	mg/kg	6010B	04/28/2005
Zinc Dry Basis	619	mg/kg	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-55 **Description:** MATRIX SPIKE OF 2005040193-1 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	94	% [75-125]	6020	05/03/2005
Arsenic Dry Basis	101	% [75-125]	6010B	04/28/2005
Barium Dry Basis	101	% [75-125]	6010B	04/28/2005
Cadmium Dry Basis	99	% [75-125]	6010B	04/28/2005
Chromium Dry Basis	96	% [75-125]	6010B	04/28/2005
Copper Dry Basis	106	% [75-125]	6010B	04/28/2005
Iron Dry Basis	(2)	% [75-125]	6010B	05/02/2005
Lead Dry Basis	97	% [75-125]	6010B	04/28/2005
Manganese Dry Basis	(2)	% [75-125]	6010B	05/02/2005
Mercury Dry Basis	100	% [75-125]	6020A	05/02/2005
Nickel Dry Basis	100	% [75-125]	6010B	04/28/2005
Silver Dry Basis	103	% [75-125]	6010B	04/28/2005
Zinc Dry Basis	94	% [75-125]	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-56 **Description:** MATRIX SPIKE DUPLICATE OF 2005040193-1 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	1	RPD [0-20]	6020	05/03/2005
Arsenic Dry Basis	1	RPD [0-20]	6010B	04/28/2005
Barium Dry Basis	3	RPD [0-20]	6010B	04/28/2005
Cadmium Dry Basis	2	RPD [0-20]	6010B	04/28/2005
Chromium Dry Basis	0	RPD [0-20]	6010B	04/28/2005
Copper Dry Basis	2	RPD [0-20]	6010B	04/28/2005
Iron Dry Basis	17	RPD [0-20]	6010B	05/02/2005
Lead Dry Basis	3	RPD [0-20]	6010B	04/28/2005
Manganese Dry Basis	(2)	RPD [0-20]	6010B	05/02/2005
Mercury Dry Basis	3	RPD [0-20]	6020A	05/02/2005
Nickel Dry Basis	2	RPD [0-20]	6010B	04/28/2005
Silver Dry Basis	2	RPD [0-20]	6010B	04/28/2005
Zinc Dry Basis	1	RPD [0-20]	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-57 **Description:** SOIL LAB CONTROL SAMPLE **Matrix:** SOIL

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	80	% [10-223]	6020	05/03/2005
Arsenic Dry Basis	97	% [79-121]	6010B	04/28/2005
Barium Dry Basis	99	% [80-120]	6010B	04/28/2005
Cadmium Dry Basis	97	% [80-120]	6010B	04/28/2005
Chromium Dry Basis	98	% [79-122]	6010B	04/28/2005
Copper Dry Basis	99	% [82-118]	6010B	04/28/2005
Iron Dry Basis	102	% [57-143]	6010B	05/02/2005
Lead Dry Basis	100	% [79-121]	6010B	04/28/2005
Manganese Dry Basis	97	% [80-120]	6010B	04/28/2005
Mercury Dry Basis	87	% [59-141]	6020A	05/02/2005
Nickel Dry Basis	99	% [82-118]	6010B	04/28/2005
Silver Dry Basis	102	% [61-138]	6010B	04/28/2005
Zinc Dry Basis	98	% [79-121]	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-58 **Description:** AQUEOUS LAB CONTROL SAMPLE **Matrix:** WATER

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	92	% [80-120]	6020	05/03/2005
Arsenic Dry Basis	104	% [80-120]	6010B	04/28/2005
Barium Dry Basis	104	% [80-120]	6010B	04/28/2005
Cadmium Dry Basis	102	% [80-120]	6010B	04/28/2005
Chromium Dry Basis	102	% [80-120]	6010B	04/28/2005
Copper Dry Basis	104	% [80-120]	6010B	04/28/2005
Iron Dry Basis	102	% [80-120]	6010B	05/02/2005
Lead Dry Basis	106	% [80-120]	6010B	04/28/2005
Manganese Dry Basis	104	% [80-120]	6010B	04/28/2005
Mercury Dry Basis	99	% [80-120]	6020A	05/02/2005
Nickel Dry Basis	104	% [80-120]	6010B	04/28/2005
Silver Dry Basis	104	% [80-120]	6010B	04/28/2005
Zinc Dry Basis	98	% [80-120]	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-59 **Description:** METHOD BLANK **Matrix:** WATER

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<0.05	mg/l	6020	05/03/2005
Arsenic Dry Basis	<0.1	mg/l	6010B	04/28/2005
Barium Dry Basis	<0.05	mg/l	6010B	04/28/2005
Cadmium Dry Basis	<0.02	mg/l	6010B	04/28/2005
Chromium Dry Basis	<0.02	mg/l	6010B	04/28/2005
Copper Dry Basis	<0.1	mg/l	6010B	04/28/2005
Iron Dry Basis	<0.1	mg/l	6010B	05/02/2005
Lead Dry Basis	<0.1	mg/l	6010B	04/28/2005
Manganese Dry Basis	<0.02	mg/l	6010B	04/28/2005
Mercury Dry Basis	<0.005	mg/l	6020A	05/02/2005
Nickel Dry Basis	<0.05	mg/l	6010B	04/28/2005
Silver Dry Basis	<0.05	mg/l	6010B	04/28/2005
Zinc Dry Basis	<0.1	mg/l	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1262	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1265	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1265	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-61 **Description:** MATRIX SPIKE OF 2005040193-21 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	94	% [75-125]	6020	05/03/2005
Arsenic Dry Basis	88	% [75-125]	6010B	04/28/2005
Barium Dry Basis	82	% [75-125]	6010B	04/28/2005
Cadmium Dry Basis	98	% [75-125]	6010B	04/28/2005
Chromium Dry Basis	96	% [75-125]	6010B	04/28/2005
Copper Dry Basis	106	% [75-125]	6010B	04/28/2005
Iron Dry Basis	(2)	% [75-125]	6010B	05/02/2005
Lead Dry Basis	(2)	% [75-125]	6010B	04/28/2005
Manganese Dry Basis	(2)	% [75-125]	6010B	05/09/2005
Mercury Dry Basis	102	% [75-125]	6020A	05/02/2005
Nickel Dry Basis	99	% [75-125]	6010B	04/28/2005
Silver Dry Basis	106	% [75-125]	6010B	04/28/2005
Zinc Dry Basis	(2)	% [75-125]	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-62 **Description:** MATRIX SPIKE DUPLICATE OF 2005040193-21 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/18/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	1	RPD [0-20]	6020	05/03/2005
Arsenic Dry Basis	1	RPD [0-20]	6010B	04/28/2005
Barium Dry Basis	3	RPD [0-20]	6010B	04/28/2005
Cadmium Dry Basis	0	RPD [0-20]	6010B	04/28/2005
Chromium Dry Basis	1	RPD [0-20]	6010B	04/28/2005
Copper Dry Basis	1	RPD [0-20]	6010B	04/28/2005
Iron Dry Basis	3	RPD [0-20]	6010B	05/02/2005
Lead Dry Basis	9	RPD [0-20]	6010B	04/28/2005
Manganese Dry Basis	7	RPD [0-20]	6010B	05/09/2005
Mercury Dry Basis	2	RPD [0-20]	6020A	05/02/2005
Nickel Dry Basis	0	RPD [0-20]	6010B	04/28/2005
Silver Dry Basis	3	RPD [0-20]	6010B	04/28/2005
Zinc Dry Basis	5	RPD [0-20]	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-63 **Description:** SOIL LAB CONTROL SAMPLE **Matrix:** SOIL
Date Received: -----
Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	108	% [80-120]	3c MOD	04/29/2005
Hardness as CaCO3	NA	-----	-----	
Cation Exchange Capacity	NA	-----	-----	
Electrical Conductivity Saturated Paste	139	% [48-151]	3a	04/29/2005
pH Saturated Paste	98	% [93-107]	21(a) ASA	04/29/2005
Calcium saturated paste	90	% [52-148]	6010B	05/13/2005
Magnesium saturated paste	83	% [56-144]	6010B	05/13/2005
Sulfate Water Soluble Dry Basis	105	% [84-122]	10-3.7MOD	04/29/2005
PARTICLE SIZE ANALYSIS				
Sand	96	% [72-128]	42b mod.	05/03/2005
Silt	112	% [74-126]	42b mod.	05/03/2005
Clay	130	% [65-135]	42b mod.	05/03/2005
Texture	Loam		42b mod.	05/03/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	74	% [10-223]	6020	05/03/2005
Arsenic Dry Basis	103	% [79-121]	6010B	04/28/2005
Barium Dry Basis	102	% [80-120]	6010B	04/28/2005
Cadmium Dry Basis	101	% [80-120]	6010B	04/28/2005
Chromium Dry Basis	102	% [79-121]	6010B	04/28/2005
Copper Dry Basis	103	% [82-118]	6010B	04/28/2005
Iron Dry Basis	108	% [57-143]	6010B	04/28/2005
Lead Dry Basis	104	% [79-121]	6010B	04/28/2005
Manganese Dry Basis	102	% [80-120]	6010B	04/28/2005
Mercury Dry Basis	81	% [59-141]	6020A	05/02/2005
Nickel Dry Basis	102	% [82-118]	6010B	04/28/2005
Silver Dry Basis	106	% [61-138]	6010B	04/28/2005
Zinc Dry Basis	102	% [79-121]	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-64 **Description:** AQUEOUS LAB CONTROL SAMPLE **Matrix:** WATER

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	100	% [80-120]	3c MOD	04/29/2005
Hardness as CaCO3	NA	-----	-----	
Cation Exchange Capacity	NA	-----	-----	-----
Electrical Conductivity Saturated Paste	99	% [90-110]	3a	04/29/2005
pH Saturated Paste	99	% [99-101]	21(a) ASA	04/29/2005
Calcium saturated paste	105	% [92-111]	6010B	05/13/2005
Magnesium saturated paste	102	% [92-115]	6010B	05/13/2005
Sulfate Water Soluble Dry Basis	103	% [94-113]	10-3.7MOD	04/29/2005
PARTICLE SIZE ANALYSIS				
Sand	NA	-----	-----	-----
Silt	NA	-----	-----	-----
Clay	NA	-----	-----	-----
Texture	NA	-----	-----	-----
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	90	% [80-120]	6020	05/03/2005
Arsenic Dry Basis	104	% [80-120]	6010B	04/28/2005
Barium Dry Basis	102	% [80-120]	6010B	04/28/2005
Cadmium Dry Basis	102	% [80-120]	6010B	04/28/2005
Chromium Dry Basis	101	% [80-120]	6010B	04/28/2005
Copper Dry Basis	103	% [80-120]	6010B	04/28/2005
Iron Dry Basis	109	% [80-120]	6010B	04/28/2005
Lead Dry Basis	104	% [80-120]	6010B	04/28/2005
Manganese Dry Basis	104	% [80-120]	6010B	04/28/2005
Mercury Dry Basis	96	% [80-120]	6020A	05/02/2005
Nickel Dry Basis	104	% [80-120]	6010B	04/28/2005
Silver Dry Basis	102	% [80-120]	6010B	04/28/2005
Zinc Dry Basis	101	% [80-120]	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-65 **Description:** METHOD BLANK **Matrix:** WATER
Date Received: -----
Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
INORGANICS				
Chloride (Water Soluble)	<20	mg/kg	3c MOD	04/29/2005
Hardness as CaCO3	<7	mg/l	2340B	05/13/2005
Cation Exchange Capacity	<0.9	meq/100g	19 ASA	05/12/2005
Electrical Conductivity Saturated Paste	<0.01	mmhos/cm	3a	04/29/2005
pH Saturated Paste	NA	-----	-----	-----
Calcium saturated paste	<0.05	meq/l	6010B	05/13/2005
Magnesium saturated paste	<0.08	meq/l	6010B	05/13/2005
Sulfate Water Soluble Dry Basis	<0.01	%	10-3.7MOD	04/29/2005
PARTICLE SIZE ANALYSIS				
Sand	NA	-----	-----	-----
Silt	NA	-----	-----	-----
Clay	NA	-----	-----	-----
Texture	NA	-----	-----	-----
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<0.05	mg/l	6020	05/03/2005
Arsenic Dry Basis	<0.1	mg/l	6010B	04/28/2005
Barium Dry Basis	<0.05	mg/l	6010B	04/28/2005
Cadmium Dry Basis	<0.02	mg/l	6010B	04/28/2005
Chromium Dry Basis	<0.02	mg/l	6010B	04/28/2005
Copper Dry Basis	<0.1	mg/l	6010B	04/28/2005
Iron Dry Basis	<0.1	mg/l	6010B	04/28/2005
Lead Dry Basis	<0.1	mg/l	6010B	04/28/2005
Manganese Dry Basis	<0.02	mg/l	6010B	04/28/2005
Mercury Dry Basis	<0.005	mg/l	6020A	05/02/2005
Nickel Dry Basis	<0.05	mg/l	6010B	04/28/2005
Silver Dry Basis	<0.05	mg/l	6010B	04/28/2005
Zinc Dry Basis	<0.1	mg/l	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1263	-----	3050B-M	04/26/2005
ICPMS Batch#/Digest Date	1267	-----	3050B-SB	04/29/2005
Mercury Batch #/Digest Date	1267	-----	3050B-HG	04/29/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-67 **Description:** MATRIX SPIKE OF 2005040193-41 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	106*	% [80-120]	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	87	% [75-125]	6020	05/03/2005
Arsenic Dry Basis	88	% [75-125]	6010B	04/28/2005
Barium Dry Basis	120	% [75-125]	6010B	05/03/2005
Cadmium Dry Basis	92	% [75-125]	6010B	04/28/2005
Chromium Dry Basis	96	% [75-125]	6010B	04/28/2005
Copper Dry Basis	107	% [75-125]	6010B	05/03/2005
Iron Dry Basis	(2)	% [75-125]	6010B	05/02/2005
Lead Dry Basis	(2)	% [75-125]	6010B	04/28/2005
Manganese Dry Basis	(2)	% [75-125]	6010B	05/02/2005
Mercury Dry Basis	108	% [75-125]	6020A	05/02/2005
Nickel Dry Basis	99	% [75-125]	6010B	04/28/2005
Silver Dry Basis	107	% [75-125]	6010B	04/28/2005
Zinc Dry Basis	(2)	% [75-125]	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

*Matrix Spike of 2005040193-47

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-68 **Description:** MATRIX SPIKE DUPLICATE OF 2005040193-47 **Matrix:** SOIL

Date Received: 04/22/2005

Date Collected: 04/19/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	24 (6)*	RPD [0-20]	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	1	RPD [0-20]	6020	05/03/2005
Arsenic Dry Basis	4	RPD [0-20]	6010B	04/28/2005
Barium Dry Basis	3	RPD [0-20]	6010B	05/03/2005
Cadmium Dry Basis	0	RPD [0-20]	6010B	04/28/2005
Chromium Dry Basis	5	RPD [0-20]	6010B	04/28/2005
Copper Dry Basis	4	RPD [0-20]	6010B	05/03/2005
Iron Dry Basis	4	RPD [0-20]	6010B	05/02/2005
Lead Dry Basis	14	RPD [0-20]	6010B	04/28/2005
Manganese Dry Basis	8	RPD [0.20]	6010B	05/02/2005
Mercury Dry Basis	7	RPD [0-20]	6020A	05/02/2005
Nickel Dry Basis	2	RPD [0-20]	6010B	04/28/2005
Silver Dry Basis	4	RPD [0-20]	6010B	04/28/2005
Zinc Dry Basis	4	RPD [0-20]	6010B	05/02/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

*Matrix Spike Duplicate of 2005040193-47

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-69 **Description:** SOIL LAB CONTROL SAMPLE **Matrix:** SOIL

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	88	% [73-131]	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	79	% [10-223]	6020	05/03/2005
Arsenic Dry Basis	103	% [79-121]	6010B	04/28/2005
Barium Dry Basis	89	% [80-120]	6010B	05/03/2005
Cadmium Dry Basis	102	% [80-120]	6010B	04/28/2005
Chromium Dry Basis	105	% [79-122]	6010B	04/28/2005
Copper Dry Basis	91	% [82-118]	6010B	05/03/2005
Iron Dry Basis	105	% [57-143]	6010B	05/02/2005
Lead Dry Basis	104	% [79-121]	6010B	04/28/2005
Manganese Dry Basis	101	% [80-120]	6010B	04/28/2005
Mercury Dry Basis	91	% [59-141]	6020A	05/02/2005
Nickel Dry Basis	103	% [82-118]	6010B	04/28/2005
Silver Dry Basis	104	% [61-138]	6010B	04/28/2005
Zinc Dry Basis	101	% [79-121]	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-70 **Description:** AQUEOUS LAB CONTROL SAMPLE **Matrix:** WATER

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	NA	-----	-----	-----
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	90	% [80-120]	6020	05/03/2005
Arsenic Dry Basis	101	% [80-120]	6010B	04/28/2005
Barium Dry Basis	94	% [80-120]	6010B	05/03/2005
Cadmium Dry Basis	100	% [80-120]	6010B	04/28/2005
Chromium Dry Basis	98	% [80-120]	6010B	04/28/2005
Copper Dry Basis	90	% [80-120]	6010B	05/03/2005
Iron Dry Basis	106	% [80-120]	6010B	05/02/2005
Lead Dry Basis	103	% [80-120]	6010B	04/28/2005
Manganese Dry Basis	103	% [80-120]	6010B	04/28/2005
Mercury Dry Basis	98	% [80-120]	6020A	05/02/2005
Nickel Dry Basis	102	% [80-120]	6010B	04/28/2005
Silver Dry Basis	99	% [80-120]	6010B	04/28/2005
Zinc Dry Basis	98	% [80-120]	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040193-71 **Description:** METHOD BLANK **Matrix:** WATER

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ORGANICS				
Organic Carbon dry basis	<0.1	%	24	04/29/2005
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<0.05	mg/l	6020	05/03/2005
Arsenic Dry Basis	<0.1	mg/l	6010B	04/28/2005
Barium Dry Basis	<0.05	mg/l	6010B	05/03/2005
Cadmium Dry Basis	<0.02	mg/l	6010B	04/28/2005
Chromium Dry Basis	<0.02	mg/l	6010B	04/28/2005
Copper Dry Basis	<0.1	mg/l	6010B	05/03/2005
Iron Dry Basis	<0.1	mg/l	6010B	05/02/2005
Lead Dry Basis	<0.1	mg/l	6010B	04/28/2005
Manganese Dry Basis	<0.02	mg/l	6010B	04/28/2005
Mercury Dry Basis	<0.005	mg/l	6020A	05/02/2005
Nickel Dry Basis	<0.05	mg/l	6010B	04/28/2005
Silver Dry Basis	<0.05	mg/l	6010B	04/28/2005
Zinc Dry Basis	<0.1	mg/l	6010B	04/28/2005
ICP/AA Batch#/Digest Date	1264	-----	3050B-M	04/27/2005
ICPMS Batch#/Digest Date	1268	-----	3050B-SB	04/28/2005
Mercury Batch #/Digest Date	1268	-----	3050B-HG	04/28/2005

CHAIN OF CUSTODY RECORD

NORTHERN Analytical Laboratories, Inc.

602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Project or Site Name: Spring Meadow Lake (SML)

Project Number: 51129-305MLSRI

Sampler Name (Printed): Joe Faubion

Project Manager, Report to: Ed Surbrugg

Report to (Firm or Agency): Tetra Tech EM Inc

Address: 7 West 6th Ave Suite 612

City: Helena State: MT Zip: 59601

Phone: 406 442-5588 Fax: 442-7182

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX Soil	NO. OF CONTAINERS	TAL Metals	Particle size	CEC	Partial Agricultural				NOTES	LAB NUMBER 2005 040193
4/18/05	0900	TP-151	G	SS	1	X								1
↓	0920	TP-152	G	Soil	1	X								2
	0931	TP-153A	↓	↓	1	X								3
	0935	TP-153B			1	X								4
	0945	TP-154A			1	X								5
	0952	TP-154B			1	X								6
	1015	TP-155A			1	X								7
	1020	TP-155B			1	X								8
	1025	TP-156A			1	X							CEC = Cation Exchange Capacity	9
	1030	TP-156B			1	X	X	X	X				Partial Agricultural	CAL paste Mag + 10
	1045	TP-157A			1	X							paste (pH, cond, hardness chloride sulfate) H_2O soil	11
↓	1050	TP-157B	↓	↓	1	X	X	X	X					12

Relinquished by:	Date	Time	Received by:
[signature]	4-21-05	1610	
FedEx	4/22/05	0930	[signature]

* TAL Metals
Sb, As, Ba, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Ag, Zn

Spring Meadow Lake (SML)
Project/or Site Name

S1129-30-SMLSRI
Project Number

Joe Fassbind
Sampler Name (Printed)

Ed Sorbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EMI
Report to (Firm or Agency)

7 West 6th Ave Ste 612
Address

Helena MT 59601
City State Zip

406-442-5588 / 406-442-718
Phone Fax

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	CEC	Particle Size					NOTES	LAB NUMBER 2005 040193
4/18/05	1100	TP-158A	G	Soil	1	X								13
	1105	TP-158B			1	X	X	X						14
	1115	TP-159A			1	X								15
	1125	TP-160A			1	X								16
	1140	TP-161A			1	X								17
	1154	TP-162A			1	X								18
	1200	TP-162B			1	X	X	X						19
	1230	TP-163A			1	X								20
	1345	TP-164A			1	X								21
	1349	TP-164B			1	X	X	X						22
	1402	TP-165A			1	X								23
	1420	TP-166A			1	X								24

Relinquished by:	Date 4-21-05	Time 1610	Received by:
Relinquished by: SedEx	Date 4/22/05	Time 0930	Received by:
Relinquished by:	Date	Time	Received by:

Spring Meadow Lake (SML)
Project or Site Name

51129-305MLSRI
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EM Inc.
Report to (Firm or Agency)

7 West 6th Ave, Suite 6B
Address

Helena MT 59601
City State Zip

406 442-5588 / 406-442-718
Phone Fax

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	CEC	Particle Size	Particle IA				NOTES	LAB NUMBER 2005 04/0193
4/18/05	1425	TP-166B	G	Soil	1	X								25
	1445	TP-167A			1	X								26
	1450	TP-167B			1	X	X	X	X					27
	1525	TP-168A			1	X								28
	1530	TP-168B			1	X								29
	1545	TP-168C			1	X								30
	1555	TP-169A			1	X								31
	1600	TP-169B			1	X	X	X	X					32
4/19/05	947	TP-170A			1	X								33
	950	TP-170B			1	X								34
	951	TP-170C			1	X								35
	1012	TP-171A			1	X								36

Relinquished by:	Date 4-21-05	Time 1610	Received by:
Relinquished by: Ed S	Date 4/22/05	Time 0930	Received by:
Relinquished by:	Date	Time	Received by:

Project or Site Name: Troy Meadow Lake (UNIL)

Project Number: 51129-305MLSRI

Sampler Name (Printed): Joe Faubion

Project Manager, Report to: Ed Surbrugg

CHAIN OF CUSTODY RECORD

NORTHERN Analytical Laboratories, Inc.

602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Report to (Firm or Agency): Tetra Tech EM Inc.

Address: 7 West 6th Ave, Suite 612

City: Helena State: MT Zip: 59601

Phone: 406-442-5588 / Fax: 406-442-7182

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	NOTES	LAB NUMBER
4/19/05	1014	TP-171B	G	Soil	1	X		37
	1017	TP-171C			1	X		38
	1035	TP-172A			1	X		39
	1100	TP-173A			1	X		40
	1102	TP-173B			1	X		41
	1104	TP-173C			1	X		42
	1136	TP-174A			1	X		43
	1140	TP-174B			1	X		44
	1143	TP-174C			1	X		45
	1144	TP-174D			1	X		46
								47
							MS #1 4955 MS 62 ~~63~~	MS
							MSD 4856 MSD 62 ~~64~~	MSD
							SLC 4957 SLC 63 ~~65~~	SLC
							ALC 5058 ALC 64 ~~66~~	ALC
							MB 5159 MB 65 ~~67~~	MB
							LCS 5260 LCS 66 ~~68~~	LCS

	Date	Time	
Relinquished by:	4-21-05	1610	Received by:
Relinquished by:	4/22/05	093	Received by:
Relinquished by:	Date	Time	Received by:

Spring Meadow Lake (SML)
Project or Site Name

S1129-30-SML-SR1
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EMI
Report to (Firm or Agency)

7 West 6th Ave Suite 612
Address

Helena MT 59601
City State Zip

(406) 442-5588
Phone

442-7182
Fax

2005
LAB NUMBER 040193

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	TOC	Field Parameters	Dissolved Metals			NOTES	LAB NUMBER
4-21-05	10:45	SD-201	grab	~~Soil~~ water	1	X	X					★TAL Metals = Sb, As, Ba, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Ag, Zn	47
	11:02	SD-202		Soil	1	X	X						48
	11:15	SD-203		soil	1	X	X					★TOC = Total Organic Carbon	49
	11:25	SW-201		water	2			X	X			★Dissolved Metal samples need filtering and preservation at the lab.	—
	11:35	SD-204		Soil	1	X	X						50
	11:40	SD-205		soil	1	X	X						51
	11:45	SD-206		Soil	1	assign same tests as outside soils now 4/22/05							52
	12:00	SW-202		water	2			X	X				—
	12:08	SD-207		soil	1	X	X						53
	12:12	SD-208		soil	1	X	X						54
	~~12:45~~	~~SW-203~~		~~Soil~~ water	~~1~~ 2	X	X	X					
	12:45	SW-203	grab	water	2			X	X				

Relinquished by:	Date 4-21-05	Time 1610	Received by:
Relinquished by: Fed Ex	Date 4/22/05	Time 0930	Received by:
Relinquished by:	Date	Time	Received by:

NORTHERN
Analytical Laboratories, Inc.

SAMPLE RECEIPT CHECKLIST

Dear Valued Client: This checklist documents the condition of your sample(s) as it (they) arrived at our lab. Please review it and familiarize yourself with its contents. Should you have any questions or comments, please contact us. Thank you for your use of our services.

Client Name: Tetra Tech

Project: Spring Meadows

Laboratory Number(s): 040192 & 193

Checklist Completed by: MW 4/22/05 (Initials / Date)

Date/Time Received: 4/22/05 0930 (Date / Time)

Received by: MW

Carrier Name: Fed Ex

Sample Type: Soil / H2O

	YES	NO
1. Shipping container in good condition?	✓	
2. Custody seals present on shipping container? Condition: Intact N/A Broken	✓	
3. Chain of custody present?	✓	
4. Chain of custody signed when relinquished and received?	✓	
5. Chain of custody agrees with sample labels?	✓	
6. Custody seals on sample bottles? Condition: Intact ____ Broken ____		✓
7. Samples in proper container/bottle?*	✓	
8. Sample containers intact?*	✓	
9. Sufficient sample volume for indicated test?*	✓	
10. Ice/Frozen Blue Ice present in shipping container? (circle one)	✓	✓
container temperature 1. 14.6°C 2. 2.0°C 3. ____ * (if <0 or>10)		
11. All samples rec'd within holding time?*	✓	
12. VOA vials have zero headspace? * (if contains >5mm headspace)	NA	
13. Trip Blank received?		✓

	YES	NO
14. pH check performed by:	Jesse & Pres	
15. Metals bottle(s) pH <2?	* in lab	
16. Nutrient bottle(s) pH <2?	NA	
17. Cyanide bottle(s) pH >12?		
18. Sulfide bottle(s) pH >9?		
19. TOC bottle(s) pH <2?		
20. Phenolics bottle(s) pH <2?		
21. Oil & grease bottle(s) pH <2? (checked by analyst)		
22. EPH/DRO bottle(s) pH <2? (checked by analyst)		
23. Volatiles (VOA) pH <2? (checked by analyst)		
24. Semivolatiles (525) pH <2? (checked by analyst)		
25. Other test types		
26. Client contacted?		
27. Person contacted		
28. Date contacted		

NOTES: **Samples may be affected when not transported at the temperature recommended by the EPA for the test you've selected. Please contact the lab if you have concerns about the temperature of your samples.**

*** Critical item - if marked "NO" contact lab manager.**

COMMENTS: _____

NORTHERN
Analytical Laboratories, Inc.

602 South 25th Street
P O Box 30315
Billings, MT 59101
Telephone: (406) 254-7226
Fax: (406) 254-1389

REPORT TO: ATTN: JOHN KOERTH
MONTANA DEPT. OF ENVIRONMENTAL QUALITY
P.O. BOX 200901
HELENA, MT 59620-0901

DATE: May 17, 2005
JOB NUMBER: 90-933-14
PAGE: 1 of 10
INVOICE NO.: 5040192

REPORT OF: Water Analysis – Spring Meadow Lake (SML) – S1129-30SMLSRI

CASE NARRATIVE:

On April 22, 2005 these water samples (laboratory numbers 2005040192-1 through -5) were received in our laboratory for analysis. Tests were conducted in accordance with EPA/600/4-79-020 "*Methods for Chemical Analysis of Water and Wastes*; "*Standard Methods for the Examination of Water and Wastewater*", 18th Edition; EPA/600/R-93-100 "*Methods for the Determination of Inorganic Substances in Environmental Samples*"; EPA/600/R-94-111 "*Methods for the Determination of Metals in Environmental Samples*", Supplement I.

The results of the analysis are shown on the following pages. A < sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this were not quantifiable. Sample results are not corrected for analyte blank concentrations. Values in brackets are the quality control limits for the associated quality control test.

The condition of the samples upon receipt at the laboratory is noted on the attached sample receipt checklist. Chain of custody documentation is enclosed.

Reviewed by _____
Denise Jensen - Quality Assurance Coordinator

cc: Attn: Ed Surbrugg
Tetra Tech EMI
7 West 6th Ave.; Suite 612
Helena, MT 59601

Attachments: Chain of Custody (2)
Sample Receipt Checklist

ba

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-1 **Description:** SW-201 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	15	mg/l	325.3	04/25/2005
Sulfate as SO4	44	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	30	mg/l	200.7	04/25/2005
Hardness as CaCO3	128	mg/l	2340B	05/17/2005
Magnesium as Mg	13	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	360	umhos/cm	2510B	04/29/2005
pH	8.9	S.U.	150.1	04/22/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.012	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.030	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	<0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	0.004	mg/l	200.8	05/09/2005
Copper as Cu (Dissolved)	0.002	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Manganese as Mn (Dissolved)	<0.005	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-2 **Description:** SW-202 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	15	mg/l	325.3	04/25/2005
Sulfate as SO4	44	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	40	mg/l	200.7	04/25/2005
Hardness as CaCO3	153	mg/l	2340B	05/17/2005
Magnesium as Mg	13	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	386	umhos/cm	2510B	04/29/2005
pH	8.4	S.U.	150.1	04/22/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.011	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.037	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	<0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	0.005	mg/l	200.8	05/09/2005
Copper as Cu (Dissolved)	0.006	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Manganese as Mn (Dissolved)	<0.005	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-3 **Description:** SW-203 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	13	mg/l	325.3	04/25/2005
Sulfate as SO4	36	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	21	mg/l	200.7	04/25/2005
Hardness as CaCO3	102	mg/l	2340B	05/17/2005
Magnesium as Mg	12	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	278	umhos/cm	2510B	04/29/2005
pH	9.2	S.U.	150.1	04/22/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.030	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.012	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	<0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	0.003	mg/l	200.8	05/09/2005
Copper as Cu (Dissolved)	0.003	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Manganese as Mn (Dissolved)	0.018	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-4 **Description:** MW-02 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	25	mg/l	325.3	04/25/2005
Sulfate as SO4	70	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	59	mg/l	200.7	04/25/2005
Hardness as CaCO3	271	mg/l	2340B	05/17/2005
Magnesium as Mg	30	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	615	umhos/cm	2510B	04/29/2005
pH	7.5	S.U.	150.1	04/22/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.010	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.043	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	0.0004	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	0.008	mg/l	200.8	05/09/2005
Copper as Cu (Dissolved)	0.002	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Manganese as Mn (Dissolved)	0.007	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	0.04	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-5 **Description:** MW-01 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	23	mg/l	325.3	04/25/2005
Sulfate as SO4	84	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	59	mg/l	200.7	04/25/2005
Hardness as CaCO3	267	mg/l	2340B	05/17/2005
Magnesium as Mg	29	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	587	umhos/cm	2510B	04/29/2005
pH	7.6	S.U.	150.1	04/22/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.029	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.041	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	0.008	mg/l	200.8	05/09/2005
Copper as Cu (Dissolved)	0.005	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Manganese as Mn (Dissolved)	0.39	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-6 **Description:** MATRIX SPIKE OF 2005040192-1 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	103	% [79-122]	325.3	04/25/2005
Sulfate as SO4	109	% [82-125]	375.2	05/02/2005
CATIONS				
Calcium as Ca	110	% [84-112]	200.7	04/25/2005
Hardness as CaCO3	NA	-----	-----	-----
Magnesium as Mg	106	% [85-112]	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	NA	-----	-----	-----
pH	NA	-----	-----	-----
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	98	% [82-117]	200.8	04/28/2005
Arsenic as As (Dissolved)	101	% [80-124]	200.8	04/28/2005
Barium as Ba (Dissolved)	99	% [78-121]	200.8	04/28/2005
Cadmium as Cd (Dissolved)	98	% [82-116]	200.8	04/28/2005
Chromium as Cr (Dissolved)	98	% [72-116]	200.8	05/09/2005
Copper as Cu (Dissolved)	109	% [70-117]	200.8	04/28/2005
Iron as Fe (Dissolved)	98	% [84-115]	200.7	04/25/2005
Lead as Pb (Dissolved)	105	% [82-114]	200.8	04/28/2005
Manganese as Mn (Dissolved)	101	% [70-129]	200.8	04/28/2005
Mercury as Hg (Dissolved)	96	% [70-117]	200.8	04/29/2005
Nickel as Ni (Dissolved)	104	% [76-118]	200.8	05/09/2005
Silver as Ag (Dissolved)	97	% [70-119]	200.8	04/28/2005
Zinc as Zn (Dissolved)	98	% [80-124]	200.7	04/25/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-7 **Description:** MATRIX SPIKE DUPLICATE OF 2005040192-1 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	0	RPD [0-20]	325.3	04/25/2005
Sulfate as SO4	3	RPD [0-20]	375.2	05/02/2005
CATIONS				
Calcium as Ca	2	RPD [0-20]	200.7	04/25/2005
Hardness as CaCO3	NA	-----	-----	-----
Magnesium as Mg	1	RPD [0-20]	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	NA	-----	-----	-----
pH	NA	-----	-----	-----
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Arsenic as As (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Barium as Ba (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Cadmium as Cd (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Chromium as Cr (Dissolved)	0	RPD [0-20]	200.8	05/09/2005
Copper as Cu (Dissolved)	7	RPD [0-20]	200.8	04/28/2005
Iron as Fe (Dissolved)	2	RPD [0-20]	200.7	04/25/2005
Lead as Pb (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Manganese as Mn (Dissolved)	0	RPD [0-20]	200.8	04/28/2005
Mercury as Hg (Dissolved)	2	RPD [0-20]	200.8	04/29/2005
Nickel as Ni (Dissolved)	1	RPD [0-20]	200.8	05/09/2005
Silver as Ag (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Zinc as Zn (Dissolved)	2	RPD [0-20]	200.7	04/25/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-8 **Description:** METHOD BLANK **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	<1	mg/l	325.3	04/25/2005
Sulfate as SO4	<5	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	<1	mg/l	200.7	04/25/2005
Hardness as CaCO3	<7	mg/l	2340B	05/17/2005
Magnesium as Mg	<1	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	<10	umhos/cm	2510B	04/29/2005
pH	NA	-----	-----	-----
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	<0.005	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	<0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	<0.001	mg/l	200.8	05/09/2005
Copper as Cu (Dissolved)	<0.001	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Manganese as Mn (Dissolved)	<0.005	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-9 **Description:** LABORATORY CONTROL SAMPLE **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	105	% [90-115]	325.3	04/25/2005
Sulfate as SO4	103	% [94-113]	375.2	05/02/2005
CATIONS				
Calcium as Ca	102	% [92-111]	200.7	04/25/2005
Hardness as CaCO3	NA	-----	-----	-----
Magnesium as Mg	99	% [92-115]	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	101	% [90-110]	2510B	04/29/2005
pH	100	% [99-101]	150.1	04/22/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	102	% [86-110]	200.8	04/28/2005
Arsenic as As (Dissolved)	98	% [85-111]	200.8	04/28/2005
Barium as Ba (Dissolved)	98	% [86-110]	200.8	04/28/2005
Cadmium as Cd (Dissolved)	100	% [88-110]	200.8	04/28/2005
Chromium as Cr (Dissolved)	102	% [85-115]	200.8	05/09/2005
Copper as Cu (Dissolved)	96	% [87-113]	200.8	04/28/2005
Iron as Fe (Dissolved)	102	% [92-111]	200.7	04/25/2005
Lead as Pb (Dissolved)	100	% [86-113]	200.8	04/28/2005
Manganese as Mn (Dissolved)	100	% [85-115]	200.8	04/28/2005
Mercury as Hg (Dissolved)	106	% [85-115]	200.8	04/29/2005
Nickel as Ni (Dissolved)	100	% [85-114]	200.8	05/09/2005
Silver as Ag (Dissolved)	101	% [85-114]	200.8	04/28/2005
Zinc as Zn (Dissolved)	101	% [89-115]	200.7	04/25/2005

Spring Meadow Lake (SML)
Project or Site Name

S1129-30-SML
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EMI
Report to (Firm or Agency)

7 West 6th Ave Suite 612
Address

Helena MT 59601
City State Zip

(406) 442-5588
Phone

442-7182
Fax

2005
LAB NUMBER
040192

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	TOC	Field Parameters	Dissolved Metals			NOTES	LAB NUMBER
4-21-05	10:45	SD-201	grab	~~Soil~~ water SA	1	X	X					★TAL Metals = Sb, As, Ba, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Ag, Zn	—
	11:02	SD-202		soil	1	X	X						—
	11:15	SD-203		soil	1	X	X					★TOC = Total Organic Carbon	—
	11:25	SW-201		water	2			X	X			★Dissolved Metal samples need filtering and preservation at the lab.	1
	11:35	SD-204		soil	1	X	X						—
	11:40	SD-205		soil	1	X	X						—
	11:45	SD-206		soil	1								—
	12:00	SW-202		water	2			X	X				2
	12:08	SD-207		soil	1	X	X						—
	12:12	SD-208		soil	1	X	X						—
	~~12:45~~	~~SW-203~~		~~soil~~ water SA	2	X	X	X					
	12:45	SW-203	grab	water	2			X	X				3

	Date	Time	Received by:
Relinquished by:	4-21-05	1610	
Relinquished by:	4/22/05	0930	
Relinquished by:	Date	Time	Received by:

Spring Meadow Lake (SML)
Project or Site Name

S1129-30-SMLSRI
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EMI
Report to (Firm or Agency)

7 west 6th Ave Suite 6l2
Address

Helena MT 59601
City State Zip

(406) 442-5588 (406) 442-7182
Phone Fax

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: Field Parameters	ANALYSIS REQUIRED: Dissolved metals	NOTES	LAB NUMBER (2005 0040)
4-21-05	14:20	MW-02	grab	water	1	X		*Dissolved metal samples need filtering and preservation at the lab.	4
	14:22	MW-02		water	1		X		
	15:15	MW-01		water	1	X			5
	15:17	MW-01		water	1		X		
								MS #1	6
								MSD	7
								MB	8
								LCS	9

Relinquished by:	Date 4-21-05	Time 1610	Received by:
Relinquished by:	Date 4/22/05	Time 0930	Received by:
Relinquished by:	Date	Time	Received by:

NORTHERN
Analytical Laboratories, Inc.

SAMPLE RECEIPT CHECKLIST

Dear Valued Client: This checklist documents the condition of your sample(s) as it (they) arrived at our lab. Please review it and familiarize yourself with its contents. Should you have any questions or comments, please contact us. Thank you for your use of our services.

Client Name: Tetra Tech

Project: Spring Meadows

Laboratory Number(s): 040192 & 193

Checklist Completed by: MW 4/22/05 (Initials / Date)

Date/Time Received: 4/22/05 0930 (Date / Time)

Received by: MW

Carrier Name: Fed Ex

Sample Type: Soil / H2O

	YES	NO
1. Shipping container in good condition?	✓	
2. Custody seals present on shipping container? Condition: Intact X Broken ____	✓	
3. Chain of custody present?	✓	
4. Chain of custody signed when relinquished and received?	✓	
5. Chain of custody agrees with sample labels?	✓	
6. Custody seals on sample bottles? Condition: Intact ____ Broken ____		✓
7. Samples in proper container/bottle?*	✓	
8. Sample containers intact?*	✓	
9. Sufficient sample volume for indicated test?*	✓	
10. Ice/Frozen Blue Ice present in shipping container? (circle one)	✓	✓
container temperature 1. 14.6° 2. 2.0° 3. ____ * (if <0 or>10)		
11. All samples rec'd within holding time?*	✓	
12. VOA vials have zero headspace? * (if contains >5mm headspace)	NA	
13. Trip Blank received?		+

	YES	NO
14. pH check performed by:	Tetra Tech	
15. Metals bottle(s) pH <2?	* in lab	
16. Nutrient bottle(s) pH <2?	NA	
17. Cyanide bottle(s) pH >12?		
18. Sulfide bottle(s) pH >9?		
19. TOC bottle(s) pH <2?		
20. Phenolics bottle(s) pH <2?		
21. Oil & grease bottle(s) pH <2? (checked by analyst)		
22. EPH/DRO bottle(s) pH <2? (checked by analyst)		
23. Volatiles (VOA) pH <2? (checked by analyst)		
24. Semivolatiles (525) pH <2? (checked by analyst)		
25. Other test types		
26. Client contacted?		+
27. Person contacted		
28. Date contacted		

NOTES: **Samples may be affected when not transported at the temperature recommended by the EPA for the test you've selected. Please contact the lab if you have concerns about the temperature of your samples.**

*** Critical item - if marked "NO" contact lab manager.**

COMMENTS: _____

NORTHERN
Analytical Laboratories, Inc.

602 South 25th Street
P O Box 30315
Billings, MT 59101
Telephone: (406) 254-7226
Fax: (406) 254-1389

REPORT TO: ATTN: JOHN KOERTH
MONTANA DEPT. OF ENVIRONMENTAL QUALITY
P.O. BOX 200901
HELENA, MT 59620-0901

DATE: June 9, 2005
JOB NUMBER: 90-933-14
PAGE: 1 of 7
INVOICE NO.: 5040193A

REPORT OF: Soil Analysis – Spring Meadow Lake (SML) – S1129-30SMLSRI

CASE NARRATIVE:

On April 22, 2005 these soil samples (laboratory numbers 2005040193-1 through -54) were received in our laboratory for analysis. The results of the original analyses requested on the chain of custody were reported on May 12, 2005. The client requested additional analyses for available potassium, phosphorous, and nitrogen on samples 2005040193-10, -12, -14, -19, -22, -27 and -32. The results of these analysis only are reported herein. Tests were conducted in accordance with American Society of Agronomy, *"Methods of Soil Analysis"*; Western States Laboratory Proficiency Testing Program, *"Soil & Plant Analytical Methods"*; and EPA/600/R-93-100 *"Methods for the Determination of Inorganic Substances in Environmental Samples"*.

The results of the analysis are shown on the following pages. A < sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this were not quantifiable. Sample results are not corrected for analyte blank concentrations. Values in brackets are the quality control limits for the associated quality control test. RPD is the abbreviation for relative percent difference.

The condition of the samples upon receipt at the laboratory is noted on the attached sample receipt checklist. Chain of custody documentation is enclosed.

Reviewed by _____
Kathleen A. Smit - Laboratory Manager

Cc: Attn: Ed Surbrugg
Tetra Tech EMI
7 West 6th Ave.; Suite 612
Helena, MT 59601

Attachments: Chain of Custody (5)
Sample Receipt Checklist

nct

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY
Project No.: S1129-30SMLSRI
Project Name: SPRING MEADOW LAKE
Collected by: JOE FAUBION
Date Received: 04/22/2005
Matrix: SOIL
Order No.: 2005040193

Sample Number	Description	Date Collected	Measured Value	Test Units	Test Method	PQL Value	Date of Analysis
Potassium Available dry basis							
10	TP-156B	04/18/2005	510	mg/kg	S-5.10	10	05/25/2005
12	TP-157B	04/18/2005	130	mg/kg	S-5.10	10	05/25/2005
14	TP-158B	04/18/2005	50	mg/kg	S-5.10	10	05/25/2005
19	TP-162B	04/18/2005	260	mg/kg	S-5.10	10	05/25/2005
22	TP-164B	04/18/2005	260	mg/kg	S-5.10	10	05/25/2005
27	TP-167B	04/18/2005	60	mg/kg	S-5.10	10	05/25/2005
32	TP-169B	04/18/2005	100	mg/kg	S-5.10	10	05/25/2005
73	DUPLICATE	-----	0	RPD [0-20]	S-5.10	10	05/25/2005
74	METHOD BLANK	----	<1	mg/l	S-5.10	1	05/25/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY
Project No.: S1129-30SMLSRI
Project Name: SPRING MEADOW LAKE
Collected by: PREPARED BY LAB
Date Received: 01/01/1900
Matrix: SOIL
Order No.: 2005040193

Sample Number	Description	Date Collected	Measured Value	Test Units	Test Method	PQL Value	Date of Analysis
Potassium Available dry basis							
75	AQUEOUS LAB CONTROL SAMPLE	—	100	% [80-120]	S-5.10	10	05/25/2005
76	SOIL LAB CONTROL SAMPLE	—	95	% [82-118]	S-5.10	10	05/25/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY
Project No.: S1129-30SMLSRI
Project Name: SPRING MEADOW LAKE
Collected by: JOE FAUBION
Date Received: 04/22/2005
Matrix: SOIL
Order No.: 2005040193

Sample Number	Description	Date Collected	Measured Value	Test Units	Test Method	PQL Value	Date of Analysis
Nitrate as N (KCL Extractable) Dry Basis							
10	TP-156B	04/18/2005	1.35	mg/kg	S3.10	0.3	05/21/2005
12	TP-157B	04/18/2005	1.78	mg/kg	S3.10	0.3	05/21/2005
14	TP-158B	04/18/2005	<1.5	mg/kg	S3.10	0.3	05/21/2005
19	TP-162B	04/18/2005	1.37	mg/kg	S3.10	0.3	05/21/2005
22	TP-164B	04/18/2005	1.02	mg/kg	S3.10	0.3	05/21/2005
27	TP-167B	04/18/2005	0.39	mg/kg	S3.10	0.3	05/21/2005
32	TP-169B	04/18/2005	0.53	mg/kg	S3.10	0.3	05/21/2005
73	DUPLICATE	----	4	RPD [0-20]	S3.10	0.3	05/21/2005
74	METHOD BLANK	----	<0.3	mg/kg	S3.10	0.3	05/21/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY
Project No.: S1129-30SMLSRI
Project Name: SPRING MEADOW LAKE
Collected by: PREPARED BY LAB
Date Received: 01/01/1900
Matrix: SOIL
Order No.: 2005040193

Sample Number	Description	Date Collected	Measured Value	Test Units	Test Method	PQL Value	Date of Analysis
Nitrate as N (KCL Extractable) Dry Basis							
75	AQUEOUS LAB CONTROL SAMPLE	-----	96	% [90-110]	S3.10	0.3	05/21/2005
76	SOIL LAB CONTROL SAMPLE	-----	92	% [80-120]	S3.10	0.3	05/21/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY
Project No.: S1129-30SMLSRI
Project Name: SPRING MEADOW LAKE
Collected by: JOE FAUBION
Date Received: 04/22/2005
Matrix: SOIL
Order No.: 2005040193

Sample Number	Description	Date Collected	Measured Value	Test Units	Test Method	PQL Value	Date of Analysis
Phosphorous Available Dry Basis							
10	TP-156B	04/18/2005	151	mg/kg	S-4.10	4	05/26/2005
12	TP-157B	04/18/2005	<4	mg/kg	S-4.10	4	05/26/2005
14	TP-158B	04/18/2005	<4	mg/kg	S-4.10	4	05/26/2005
19	TP-162B	04/18/2005	9	mg/kg	S-4.10	4	05/26/2005
22	TP-164B	04/18/2005	34	mg/kg	S-4.10	4	05/26/2005
27	TP-167B	04/18/2005	4.8	mg/kg	S-4.10	4	06/03/2005
32	TP-169B	04/18/2005	34	mg/kg	S-4.10	4	05/26/2005
73	DUPLICATE	-----	5	RPD [0-20]	S-4.10	4	05/26/2005
74	METHOD BLANK	-----	<4	mg/kg	S-4.10	4	05/26/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY
Project No.: S1129-30SMLSRI
Project Name: SPRING MEADOW LAKE
Collected by: PREPARED BY LAB
Date Received: 01/01/1900
Matrix: SOIL
Order No.: 2005040193

Sample Number	Description	Date Collected	Measured Value	Test Units	Test Method	PQL Value	Date of Analysis
Phosphorous Available Dry Basis							
75	AQUEOUS LAB CONTROL SAMPLE	----	NA	----	----	4	----
76	SOIL LAB CONTROL SAMPLE	----	111	% [68-132]	S-4.10	4	05/26/2005

Spring Meadow Lake (SML)
Project or Site Name

51129-305MLSRI
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.

602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EM Inc
Report to (Firm or Agency)

~~56~~ 7 West 6th Ave Suite 612
Address

Helena MT 59601
City State Zip

406 442-5588
Phone

Fax 442-7182

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	Particle size	CEC	Partial Agricultural				NOTES	LAB NUMBER (2005 040193)
				Soil										
4/18/05	0900	TP-151	G	S	1	X								1
	0920	TP-152	G	Soil	1	X								2
	0931	TP-153A			1	X								3
	0935	TP-153B			1	X								4
	0945	TP-154A			1	X								5
	0952	TP-154B			1	X								6
	1015	TP-155A			1	X								7
	1020	TP-155B			1	X								8
	1025	TP-156A			1	X							CEC = Cation Exchange Capacity	9
	1030	TP-156B			1	X	X	X	X				Partial Agricultural (CAL Paste, mag Paste, pH, cond, hardness, chloride, sulfate) PASS H_2O Soil	10
	1045	TP-157A			1	X								11
	1050	TP-157B			1	X	X	X	X					12

	Date	Time	Received by:
Relinquished by:	4-21-05	1610	
Relinquished by: Fed Ex	4/22/05	0930	
Relinquished by:	Date	Time	Received by:

TAL Metals
Sb, As, Ba, Cd, Cr, Co, Fe, Pb, Mn, Hg, Ni, Ag, Zn

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.

602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Project/or Site Name: Spring Meadow Lake (SML)
Project Number: S1129-30-SMLSRT
Sampler Name (Printed): Joe Fausbion
Project Manager, Report to: Ed Surbrugg

Report to (Firm or Agency): Tetra Tech EMI
Address: 7 West 6th Ave Ste 612
City: Helena State: MT Zip: 59601
Phone: 406-442-5588 / Fax: 406-442-7182

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	CEC	Particle size / Agricultural					NOTES	LAB NUMBER 2005 040193
4/18/05	1100	TP-158A	G	Soil	1	X								13
↓	1105	TP-158B	↓	↓	1	X	X	X						14
	1115	TP-159A			1	X								15
	1125	TP-160A			1	X								16
	1140	TP-161A			1	X								17
	1154	TP-162A			1	X								18
	1200	TP-162B			1	X	X	X						19
	1230	TP-163A			1	X								20
	1345	TP-164A			1	X								21
	1349	TP-164B			1	X	X	X						22
	1402	TP-165A			1	X								23
↓	1420	TP-166A	↓	↓	1	X								24

Relinquished by:	Date	Time	Received by:
[signature]	4-21-05	1610	
FedEx	4/22/05	0930	[signature]

Spring Meadow Lake (SML)
Project or Site Name

51129-305MLSRI
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EM Inc.
Report to (Firm or Agency)

7 West 6th Ave. Suite 6D2
Address

Helena MT 59601
City State Zip

406 442-5588 / 406-442-7182
Phone Fax

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	CEC	Particle Size	Particle Density				NOTES	LAB NUMBER 040193
4/18/05	1425	TP-166B	G	Soil	1	X								25
	1445	TP-167A			1	X								26
	1450	TP-167B			1	X	X	X	X					27
	1525	TP-168A			1	X								28
	1530	TP-168B			1	X								29
	1545	TP-168C			1	X								30
	1555	TP-169A			1	X								31
	1600	TP-169B			1	X	X	X	X					32
4/19/05	947	TP-170A			1	X								33
	950	TP-170B			1	X								34
	951	TP-170C			1	X								35
	1012	TP-171A			1	X								36

Relinquished by:	Date 4-21-05	Time 1610	Received by:
Relinquished by:	Date 4/22/05	Time 0930	Received by:
Relinquished by:	Date	Time	Received by:

Spring Meadow Lake (SML)
Project or Site Name

51129-305MLSRI
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EM Inc.
Report to (Firm or Agency)

7 West 6th Ave, Suite 612
Address

Helena MT 59601
City State Zip

406-442-5588 / 406-442-7182
Phone Fax

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	NOTES	LAB NUMBER
4/19/05	1014	TP-171B	G	Soil	1	X		37
	1017	TP-171C			1	X		38
	1035	TP-172A			1	X		39
	1100	TP-173A			1	X		40
	1102	TP-173B			1	X		41
	1104	TP-173C			1	X		42
	1136	TP-174A			1	X		43
	1140	TP-174B			1	X		44
	1143	TP-174C			1	X		45
	1144	TP-174D			1	X		46
								47
							MS #1 4955 MS #2 6155	MS
							MSD 4856 MSD 6254	MSD
							SLC 4957 SLC 6365	SLC
							ALC 5058 ALC 6456	ALC
							MB 5159 MB 6557	MB
							LCS 5260 LCS 6658	LCS

	Date	Time	
Relinquished by:	4-21-05	1610	Received by:
Relinquished by:	4/22/05	093	Received by:
Relinquished by:	Date	Time	Received by:

Spring Meadow Lake (SML)
Project or Site Name

S1129-30-SML-SRI
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EMI
Report to (Firm or Agency)

7 West 6th Ave Suite 612
Address

Helena MT 59601
City State Zip

(406) 442-5588
Phone

442-7182
Fax

2005

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	TOC	Field Parameters	Dissolved Metals	NOTES	LAB NUMBER 040193
4-21-05	10:45	SD-201	grab	~~Soil~~ water	1	X	X			*TAL Metals = Sb, As, Ba, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Ag, Zn	47
	11:02	SD-202		soil	1	X	X				48
	11:15	SD-203		soil	1	X	X			*TOC = Total Organic Carbon	49
	11:25	SW-201		water	2			X	X	*Dissolved Metal samples need filtering and preservation at the lab.	—
	11:35	SD-204		soil	1	X	X				50
	11:40	SD-205		soil	1	X	X				51
	11:45	SD-206		soil	1	assign same tests as other soils new 4/22/05					52
	12:00	SW-202		water	2			X	X		—
	12:08	SD-207		soil	1	X	X				53
	12:12	SD-208		soil	1	X	X				54
	~~12:45~~	~~SW-203~~		~~Soil~~ water	~~1~~ 2	X	X	X			
	12:45	SW-203	grab	water	2			X	X		

Relinquished by:	Date	Time	Received by:
	4-21-05	1610	
Relinquished by: FedEx	4/22/05	0930	
Relinquished by:	Date	Time	Received by:

NORTHERN
Analytical Laboratories, Inc.

SAMPLE RECEIPT CHECKLIST

Dear Valued Client: This checklist documents the condition of your sample(s) as it (they) arrived at our lab. Please review it and familiarize yourself with its contents. Should you have any questions or comments, please contact us. Thank you for your use of our services.

Client Name: Tetra Tech

Project: Spring Meadows

Laboratory Number(s): 040192 & 193

Checklist Completed by: MW 4/22/05 (Initials / Date)

Date/Time Received: 4/22/05 0930 (Date / Time)

Received by: MW

Carrier Name: Fed Ex

Sample Type: Soil / H2O

	YES	NO
1. Shipping container in good condition?	✓	
2. Custody seals present on shipping container? Condition: Intact ✓ Broken	✓	
3. Chain of custody present?	✓	
4. Chain of custody signed when relinquished and received?	✓	
5. Chain of custody agrees with sample labels?	✓	
6. Custody seals on sample bottles? Condition: Intact ____ Broken ____		✓
7. Samples in proper container/bottle?*	✓	
8. Sample containers intact?*	✓	
9. Sufficient sample volume for indicated test?*	✓	
10. Ice/Frozen Blue Ice present in shipping container? (circle one)	✓	✓
container temperature 1. 14.6° 2. 2.0° 3. _____ * (if <0 or>10)		
11. All samples rec'd within holding time?*	✓	
12. VOA vials have zero headspace? * (if contains >5mm headspace)	NA	
13. Trip Blank received?		✓

	YES	NO
14. pH check performed by:	Peter & Pre	
15. Metals bottle(s) pH <2?	* in lab	
16. Nutrient bottle(s) pH <2?	NA	
17. Cyanide bottle(s) pH >12?		
18. Sulfide bottle(s) pH >9?		
19. TOC bottle(s) pH <2?		
20. Phenolics bottle(s) pH <2?		
21. Oil & grease bottle(s) pH <2? (checked by analyst)		
22. EPH/DRO bottle(s) pH <2? (checked by analyst)		
23. Volatiles (VOA) pH <2? (checked by analyst)		
24. Semivolatiles (525) pH <2? (checked by analyst)		
25. Other test types		
26. Client contacted?		✓
27. Person contacted		
28. Date contacted		

NOTES: **Samples may be affected when not transported at the temperature recommended by the EPA for the test you've selected. Please contact the lab if you have concerns about the temperature of your samples.**

* **Critical item - if marked "NO" contact lab manager.**

COMMENTS: _____

NORTHERN
Analytical Laboratories, Inc.

602 South 25th Street
P O Box 30315
Billings, MT 59101
Telephone: (406) 254-7226
Fax: (406) 254-1389

REPORT TO: ATTN: JOHN KOERTH
MONTANA DEPT. OF ENVIRONMENTAL QUALITY
P.O. BOX 200901
HELENA, MT 59620-0901

Revised:	June 14, 2005
DATE:	May 17, 2005
JOB NUMBER:	90-933-14
PAGE:	1 of 19
INVOICE NO.:	5040192A

REPORT OF: Water Analysis – Spring Meadow Lake (SML) – S1129-30SMLSRI

CASE NARRATIVE:

On April 22, 2005 these water samples (laboratory numbers 2005040192-1 through -5) were received in our laboratory for analysis. Tests were conducted in accordance with EPA/600/4-79-020 "*Methods for Chemical Analysis of Water and Wastes*; "*Standard Methods for the Examination of Water and Wastewater*", 18th Edition; EPA/600/R-93-100 "*Methods for the Determination of Inorganic Substances in Environmental Samples*"; EPA/600/R-94-111 "*Methods for the Determination of Metals in Environmental Samples*", Supplement I.

The results of the analysis are shown on the following pages. A < sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this were not quantifiable. Sample results are not corrected for analyte blank concentrations. Values in brackets are the quality control limits for the associated quality control test.

The condition of the samples upon receipt at the laboratory is noted on the attached sample receipt checklist. Chain of custody documentation is enclosed.

The following footnote was used in our report:
(1) Verified by a second analysis.

Revision: The client requested additional analysis of samples 2005040192-1 through -5 for total recoverable metals. The results of this analysis are reported herein. The dissolved chromium concentrations have been revised to reflect another analysis performed on June 7, 2005. The footnote (1) was added to the report.

Reviewed by _____
Kathleen A. Smit - Laboratory Manager

Cc: Attn: Ed Surbrugg
Tetra Tech EMI
7 West 6th Ave.; Suite 612
Helena, MT 59601

Attachments: Chain of Custody (2)
Sample Receipt Checklist

nct

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-1 **Description:** SW-201 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	15	mg/l	325.3	04/25/2005
Sulfate as SO4	44	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	30	mg/l	200.7	04/25/2005
Hardness as CaCO3	128	mg/l	2340B	05/17/2005
Magnesium as Mg	13	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	360	umhos/cm	2510B	04/29/2005
pH	8.9	S.U.	150.1	04/22/2005
METALS				
Antimony as Sb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Arsenic as As (Total Recoverable)	0.012	mg/l	200.8	05/31/2005
Barium as Ba (Total Recoverable)	0.029	mg/l	200.8	05/31/2005
Cadmium as Cd (Total Recoverable)	<0.0001	mg/l	200.8	05/31/2005
Chromium as Cr (Total Recoverable)	<0.001	mg/l	200.8	05/31/2005
Copper as Cu (Total Recoverable)	<0.001(1)	mg/l	200.8	05/31/2005
Iron as Fe (Total Recoverable)	0.02	mg/l	200.7	05/27/2005
Lead as Pb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Manganese as Mn (Total Recoverable)	<0.005	mg/l	200.8	05/31/2005
Mercury as Hg (Total Recoverable)	<0.0006	mg/l	200.8	05/19/2005
Nickel as Ni (Total Recoverable)	<0.02	mg/l	200.8	05/31/2005
Silver as Ag (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Zinc as Zn (Total Recoverable)	<0.01	mg/l	200.7	05/27/2005
ICPMS Batch#/Digest Date	1339	----	200.8 TR	05/26/2005
Mercury Batch #/Digest Date	1326	----	200.7 TR	05/19/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.012	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.030	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	<0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	<0.001	mg/l	200.8	06/07/2005
Copper as Cu (Dissolved)	0.002(1)	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-1 **Description:** SW-201 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
Manganese as Mn (Dissolved)	<0.005	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-2 **Description:** SW-202 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	15	mg/l	325.3	04/25/2005
Sulfate as SO4	44	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	40	mg/l	200.7	04/25/2005
Hardness as CaCO3	153	mg/l	2340B	05/17/2005
Magnesium as Mg	13	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	386	umhos/cm	2510B	04/29/2005
pH	8.4	S.U.	150.1	04/22/2005
METALS				
Antimony as Sb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Arsenic as As (Total Recoverable)	0.012	mg/l	200.8	05/31/2005
Barium as Ba (Total Recoverable)	0.037	mg/l	200.8	05/31/2005
Cadmium as Cd (Total Recoverable)	<0.0001	mg/l	200.8	05/31/2005
Chromium as Cr (Total Recoverable)	<0.001	mg/l	200.8	05/31/2005
Copper as Cu (Total Recoverable)	<0.001(1)	mg/l	200.8	05/31/2005
Iron as Fe (Total Recoverable)	0.02	mg/l	200.7	05/27/2005
Lead as Pb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Manganese as Mn (Total Recoverable)	0.011	mg/l	200.8	05/31/2005
Mercury as Hg (Total Recoverable)	<0.0006	mg/l	200.8	05/19/2005
Nickel as Ni (Total Recoverable)	<0.02	mg/l	200.8	05/31/2005
Silver as Ag (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Zinc as Zn (Total Recoverable)	<0.01	mg/l	200.7	05/27/2005
ICPMS Batch#/Digest Date	1339	---	200.8 TR	05/26/2005
Mercury Batch #/Digest Date	1326	---	200.7 TR	05/19/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.011	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.037	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	<0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	<0.001	mg/l	200.8	06/07/2005
Copper as Cu (Dissolved)	0.006(1)	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-2 **Description:** SW-202 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
Manganese as Mn (Dissolved)	<0.005	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-3 **Description:** SW-203 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	13	mg/l	325.3	04/25/2005
Sulfate as SO4	36	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	21	mg/l	200.7	04/25/2005
Hardness as CaCO3	102	mg/l	2340B	05/17/2005
Magnesium as Mg	12	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	278	umhos/cm	2510B	04/29/2005
pH	9.2	S.U.	150.1	04/22/2005
METALS				
Antimony as Sb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Arsenic as As (Total Recoverable)	0.032	mg/l	200.8	05/31/2005
Barium as Ba (Total Recoverable)	0.009	mg/l	200.8	05/31/2005
Cadmium as Cd (Total Recoverable)	<0.0001	mg/l	200.8	05/31/2005
Chromium as Cr (Total Recoverable)	<0.001	mg/l	200.8	05/31/2005
Copper as Cu (Total Recoverable)	0.001(1)	mg/l	200.8	05/31/2005
Iron as Fe (Total Recoverable)	0.06	mg/l	200.7	05/27/2005
Lead as Pb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Manganese as Mn (Total Recoverable)	0.051	mg/l	200.8	05/31/2005
Mercury as Hg (Total Recoverable)	<0.0006	mg/l	200.8	05/19/2005
Nickel as Ni (Total Recoverable)	<0.02	mg/l	200.8	05/31/2005
Silver as Ag (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Zinc as Zn (Total Recoverable)	<0.01	mg/l	200.7	05/27/2005
ICPMS Batch#/Digest Date	1339	----	200.8 TR	05/26/2005
Mercury Batch #/Digest Date	1326	----	200.7 TR	05/19/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.030	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.012	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	<0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	<0.001	mg/l	200.8	06/07/2005
Copper as Cu (Dissolved)	0.003(1)	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-3 **Description:** SW-203 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
Manganese as Mn (Dissolved)	0.018	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-4 **Description:** MW-02 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	25	mg/l	325.3	04/25/2005
Sulfate as SO4	70	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	59	mg/l	200.7	04/25/2005
Hardness as CaCO3	271	mg/l	2340B	05/17/2005
Magnesium as Mg	30	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	615	umhos/cm	2510B	04/29/2005
pH	7.5	S.U.	150.1	04/22/2005
METALS				
Antimony as Sb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Arsenic as As (Total Recoverable)	0.012	mg/l	200.8	05/31/2005
Barium as Ba (Total Recoverable)	0.045	mg/l	200.8	05/31/2005
Cadmium as Cd (Total Recoverable)	0.0005	mg/l	200.8	05/31/2005
Chromium as Cr (Total Recoverable)	<0.001	mg/l	200.8	05/31/2005
Copper as Cu (Total Recoverable)	0.002(1)	mg/l	200.8	05/31/2005
Iron as Fe (Total Recoverable)	0.68	mg/l	200.7	05/27/2005
Lead as Pb (Total Recoverable)	0.005	mg/l	200.8	05/31/2005
Manganese as Mn (Total Recoverable)	0.026	mg/l	200.8	05/31/2005
Mercury as Hg (Total Recoverable)	<0.0006	mg/l	200.8	05/19/2005
Nickel as Ni (Total Recoverable)	<0.02	mg/l	200.8	05/31/2005
Silver as Ag (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Zinc as Zn (Total Recoverable)	0.07	mg/l	200.7	05/27/2005
ICPMS Batch#/Digest Date	1339	-----	200.8 TR	05/26/2005
Mercury Batch #/Digest Date	1326	-----	200.7 TR	05/19/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.010	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.043	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	0.0004	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	<0.001	mg/l	200.8	06/07/2005
Copper as Cu (Dissolved)	0.002(1)	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-4 **Description:** MW-02 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
Manganese as Mn (Dissolved)	0.007	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	0.04	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-5 **Description:** MW-01 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	23	mg/l	325.3	04/25/2005
Sulfate as SO4	84	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	59	mg/l	200.7	04/25/2005
Hardness as CaCO3	267	mg/l	2340B	05/17/2005
Magnesium as Mg	29	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	587	umhos/cm	2510B	04/29/2005
pH	7.6	S.U.	150.1	04/22/2005
METALS				
Antimony as Sb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Arsenic as As (Total Recoverable)	0.057	mg/l	200.8	05/31/2005
Barium as Ba (Total Recoverable)	0.13	mg/l	200.8	05/31/2005
Cadmium as Cd (Total Recoverable)	0.0005	mg/l	200.8	05/31/2005
Chromium as Cr (Total Recoverable)	0.017	mg/l	200.8	06/01/2005
Copper as Cu (Total Recoverable)	0.025(1)	mg/l	200.8	06/01/2005
Iron as Fe (Total Recoverable)	13.7	mg/l	200.7	05/27/2005
Lead as Pb (Total Recoverable)	0.039	mg/l	200.8	05/31/2005
Manganese as Mn (Total Recoverable)	0.88	mg/l	200.8	06/01/2005
Mercury as Hg (Total Recoverable)	<0.0006	mg/l	200.8	05/19/2005
Nickel as Ni (Total Recoverable)	<0.02	mg/l	200.8	06/01/2005
Silver as Ag (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Zinc as Zn (Total Recoverable)	0.08	mg/l	200.7	05/27/2005
ICPMS Batch#/Digest Date	1339	----	200.8 TR	05/26/2005
Mercury Batch #/Digest Date	1326	----	200.7 TR	05/19/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	0.029	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	0.041	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	<0.001	mg/l	200.8	06/07/2005
Copper as Cu (Dissolved)	0.005(1)	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-5 **Description:** MW-01 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
Manganese as Mn (Dissolved)	0.39	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-6 **Description:** MATRIX SPIKE OF 2005040192-1 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	103	% [79-122]	325.3	04/25/2005
Sulfate as SO4	109	% [82-125]	375.2	05/02/2005
CATIONS				
Calcium as Ca	110	% [84-112]	200.7	04/25/2005
Hardness as CaCO3	NA	----	----	----
Magnesium as Mg	106	% [85-112]	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	NA	----	----	----
pH	NA	----	----	----
METALS				
Antimony as Sb (Total Recoverable)	97	% [92-128]	200.8	05/31/2005
Arsenic as As (Total Recoverable)	103	% [74-124]	200.8	05/31/2005
Barium as Ba (Total Recoverable)	101	% [71-128]	200.8	05/31/2005
Cadmium as Cd (Total Recoverable)	102	% [81-114]	200.8	05/31/2005
Chromium as Cr (Total Recoverable)	92	% [73-117]	200.8	05/31/2005
Copper as Cu (Total Recoverable)	87	% [70-118]	200.8	05/31/2005
Iron as Fe (Total Recoverable)	112	% [73-130]	200.7	05/27/2005
Lead as Pb (Total Recoverable)	103	% [75-122]	200.8	05/31/2005
Manganese as Mn (Total Recoverable)	97	% [72-127]	200.8	05/31/2005
Mercury as Hg (Total Recoverable)	105	% [70-130]	200.8	05/19/2005
Nickel as Ni (Total Recoverable)	94	% [70-124]	200.8	05/31/2005
Silver as Ag (Total Recoverable)	82	% [70-130]	200.8	05/31/2005
Zinc as Zn (Total Recoverable)	112	% [73-129]	200.7	05/27/2005
ICPMS Batch#/Digest Date	1339	-----	200.8 TR	05/26/2005
Mercury Batch #/Digest Date	1326	----	200.7 TR	05/19/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	98	% [82-117]	200.8	04/28/2005
Arsenic as As (Dissolved)	101	% [80-124]	200.8	04/28/2005
Barium as Ba (Dissolved)	99	% [78-121]	200.8	04/28/2005
Cadmium as Cd (Dissolved)	98	% [82-116]	200.8	04/28/2005
Chromium as Cr (Dissolved)	103	% [72-116]	200.8	06/07/2005
Copper as Cu (Dissolved)	109	% [70-117]	200.8	04/28/2005
Iron as Fe (Dissolved)	98	% [84-115]	200.7	04/25/2005
Lead as Pb (Dissolved)	105	% [82-114]	200.8	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-6 **Description:** MATRIX SPIKE OF 2005040192-1 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
Manganese as Mn (Dissolved)	101	% [70-129]	200.8	04/28/2005
Mercury as Hg (Dissolved)	96	% [70-117]	200.8	04/29/2005
Nickel as Ni (Dissolved)	104	% [76-118]	200.8	05/09/2005
Silver as Ag (Dissolved)	97	% [70-119]	200.8	04/28/2005
Zinc as Zn (Dissolved)	98	% [80-124]	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-7 **Description:** MATRIX SPIKE DUPLICATE OF 2005040192-1 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	0	RPD [0-20]	325.3	04/25/2005
Sulfate as SO4	3	RPD [0-20]	375.2	05/02/2005
CATIONS				
Calcium as Ca	2	RPD [0-20]	200.7	04/25/2005
Hardness as CaCO3	NA	-----	-----	-----
Magnesium as Mg	1	RPD [0-20]	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	NA	-----	-----	-----
pH	NA	-----	-----	-----
METALS				
Antimony as Sb (Total Recoverable)	1	RPD [0-20]	200.8	05/31/2005
Arsenic as As (Total Recoverable)	0	RPD [0-20]	200.8	05/31/2005
Barium as Ba (Total Recoverable)	0	RPD [0-20]	200.8	05/31/2005
Cadmium as Cd (Total Recoverable)	1	RPD [0-20]	200.8	05/31/2005
Chromium as Cr (Total Recoverable)	0	RPD [0-20]	200.8	05/31/2005
Copper as Cu (Total Recoverable)	1	RPD [0-20]	200.8	05/31/2005
Iron as Fe (Total Recoverable)	2	RPD [0-20]	200.7	05/27/2005
Lead as Pb (Total Recoverable)	1	RPD [0-20]	200.8	05/31/2005
Manganese as Mn (Total Recoverable)	1	RPD [0-20]	200.8	05/31/2005
Mercury as Hg (Total Recoverable)	2	RPD [0-20]	200.8	05/19/2005
Nickel as Ni (Total Recoverable)	2	RPD [0-20]	200.8	05/31/2005
Silver as Ag (Total Recoverable)	13	RPD [0-20]	200.8	05/31/2005
Zinc as Zn (Total Recoverable)	2	RPD [0-20]	200.7	05/27/2005
ICPMS Batch#/Digest Date	1339	-----	200.8 TR	05/26/2005
Mercury Batch #/Digest Date	1326	-----	200.7 TR	05/19/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Arsenic as As (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Barium as Ba (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Cadmium as Cd (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Chromium as Cr (Dissolved)	1	RPD [0-20]	200.8	06/07/2005
Copper as Cu (Dissolved)	7	RPD [0-20]	200.8	04/28/2005
Iron as Fe (Dissolved)	2	RPD [0-20]	200.7	04/25/2005
Lead as Pb (Dissolved)	1	RPD [0-20]	200.8	04/28/2005

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-7 **Description:** MATRIX SPIKE DUPLICATE OF 2005040192-1 **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: 04/21/2005 **Collected by:** JOE FAUBION

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
Manganese as Mn (Dissolved)	0	RPD [0-20]	200.8	04/28/2005
Mercury as Hg (Dissolved)	2	RPD [0-20]	200.8	04/29/2005
Nickel as Ni (Dissolved)	1	RPD [0-20]	200.8	05/09/2005
Silver as Ag (Dissolved)	1	RPD [0-20]	200.8	04/28/2005
Zinc as Zn (Dissolved)	2	RPD [0-20]	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-8 **Description:** METHOD BLANK **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: ---- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	<1	mg/l	325.3	04/25/2005
Sulfate as SO4	<5	mg/l	375.2	05/02/2005
CATIONS				
Calcium as Ca	<1	mg/l	200.7	04/25/2005
Hardness as CaCO3	<7	mg/l	2340B	05/17/2005
Magnesium as Mg	<1	mg/l	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	<10	umhos/cm	2510B	04/29/2005
pH	NA	----	----	----
METALS				
Antimony as Sb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Arsenic as As (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Barium as Ba (Total Recoverable)	<0.005	mg/l	200.8	05/31/2005
Cadmium as Cd (Total Recoverable)	<0.0001	mg/l	200.8	05/31/2005
Chromium as Cr (Total Recoverable)	<0.001	mg/l	200.8	05/31/2005
Copper as Cu (Total Recoverable)	<0.001	mg/l	200.8	05/31/2005
Iron as Fe (Total Recoverable)	<0.01	mg/l	200.7	05/27/2005
Lead as Pb (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Manganese as Mn (Total Recoverable)	<0.005	mg/l	200.8	05/31/2005
Mercury as Hg (Total Recoverable)	<0.0006	mg/l	200.8	05/19/2005
Nickel as Ni (Total Recoverable)	<0.02	mg/l	200.8	05/31/2005
Silver as Ag (Total Recoverable)	<0.003	mg/l	200.8	05/31/2005
Zinc as Zn (Total Recoverable)	<0.01	mg/l	200.7	05/27/2005
ICPMS Batch#/Digest Date	1339	-----	200.8 TR	05/26/2005
Mercury Batch #/Digest Date	1326	-----	200.7 TR	05/19/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Arsenic as As (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Barium as Ba (Dissolved)	<0.005	mg/l	200.8	04/28/2005
Cadmium as Cd (Dissolved)	<0.0001	mg/l	200.8	04/28/2005
Chromium as Cr (Dissolved)	<0.001	mg/l	200.8	06/07/2005
Copper as Cu (Dissolved)	<0.001	mg/l	200.8	04/28/2005
Iron as Fe (Dissolved)	<0.01	mg/l	200.7	04/25/2005
Lead as Pb (Dissolved)	<0.003	mg/l	200.8	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-8 **Description:** METHOD BLANK **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
Manganese as Mn (Dissolved)	<0.005	mg/l	200.8	04/28/2005
Mercury as Hg (Dissolved)	<0.0006	mg/l	200.8	04/29/2005
Nickel as Ni (Dissolved)	<0.02	mg/l	200.8	05/09/2005
Silver as Ag (Dissolved)	<0.003	mg/l	200.8	04/28/2005
Zinc as Zn (Dissolved)	<0.01	mg/l	200.7	04/25/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-9 **Description:** LABORATORY CONTROL SAMPLE **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
ANIONS				
Chloride as Cl	105	% [90-115]	325.3	04/25/2005
Sulfate as SO4	103	% [94-113]	375.2	05/02/2005
CATIONS				
Calcium as Ca	102	% [92-111]	200.7	04/25/2005
Hardness as CaCO3	NA	-----	-----	-----
Magnesium as Mg	99	% [92-115]	200.7	04/25/2005
INORGANICS				
Electrical Conductivity	101	% [90-110]	2510B	04/29/2005
pH	100	% [99-101]	150.1	04/22/2005
METALS				
Antimony as Sb (Total Recoverable)	96	% [85-115]	200.8	05/31/2005
Arsenic as As (Total Recoverable)	92	% [85-115]	200.8	05/31/2005
Barium as Ba (Total Recoverable)	101	% [85-115]	200.8	05/31/2005
Cadmium as Cd (Total Recoverable)	101	% [85-113]	200.8	05/31/2005
Chromium as Cr (Total Recoverable)	99	% [85-115]	200.8	05/31/2005
Copper as Cu (Total Recoverable)	98	% [85-115]	200.8	05/31/2005
Iron as Fe (Total Recoverable)	108	% [91-115]	200.7	05/27/2005
Lead as Pb (Total Recoverable)	104	% [85-115]	200.8	05/31/2005
Manganese as Mn (Total Recoverable)	103	% [85-115]	200.8	05/31/2005
Mercury as Hg (Total Recoverable)	104	% [85-115]	200.8	05/19/2005
Nickel as Ni (Total Recoverable)	98	% [85-115]	200.8	05/31/2005
Silver as Ag (Total Recoverable)	100	% [85-115]	200.8	05/31/2005
Zinc as Zn (Total Recoverable)	107	% [85-115]	200.7	05/27/2005
ICPMS Batch#/Digest Date	1339	-----	200.8 TR	05/26/2005
Mercury Batch #/Digest Date	1326	-----	200.7 TR	05/19/2005
TARGET ANALYTE LIST (DISSOLVED)				
Antimony as Sb (Dissolved)	102	% [86-110]	200.8	04/28/2005
Arsenic as As (Dissolved)	98	% [85-111]	200.8	04/28/2005
Barium as Ba (Dissolved)	98	% [86-110]	200.8	04/28/2005
Cadmium as Cd (Dissolved)	100	% [88-110]	200.8	04/28/2005
Chromium as Cr (Dissolved)	106	% [85-115]	200.8	06/07/2005
Copper as Cu (Dissolved)	96	% [87-113]	200.8	04/28/2005
Iron as Fe (Dissolved)	102	% [92-111]	200.7	04/25/2005
Lead as Pb (Dissolved)	100	% [86-113]	200.8	04/28/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: S1129-30-SMLSRI

Project Name: SPRING MEADOW LAKE

Sample No.: 2005040192-9 **Description:** LABORATORY CONTROL SAMPLE **Matrix:** WATER

Date Received: 04/22/2005

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
Manganese as Mn (Dissolved)	100	% [85-115]	200.8	04/28/2005
Mercury as Hg (Dissolved)	106	% [85-115]	200.8	04/29/2005
Nickel as Ni (Dissolved)	100	% [85-114]	200.8	05/09/2005
Silver as Ag (Dissolved)	101	% [85-114]	200.8	04/28/2005
Zinc as Zn (Dissolved)	101	% [89-115]	200.7	04/25/2005

Spring Meadow Lake (SML)
Project or Site Name

S1129-30-SMLSRI
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EMI
Report to (Firm or Agency)

7 West 6th Ave Suite 612
Address

Helena MT 59601
City State Zip

(406) 442-5588
Phone

Fax 442-7182

2005
LAB NUMBER
040192

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: TAL Metals	TOC	Field Parameters	Dissolved Metals			NOTES	LAB NUMBER
4-21-05	10:45	SD-201	grab	~~Soil~~ water SA	1	X	X					★TAL Metals = Sb, As, Ba, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Ag, Zn	—
	11:02	SD-202		Soil	1	X	X						—
	11:15	SD-203		soil	1	X	X					★TOC = Total Organic Carbon	—
	11:25	SW-201		water	2			X	X			★Dissolved Metal samples need filtering and preservation at the lab.	1
	11:35	SD-204		Soil	1	X	X						—
	11:40	SD-205		soil	1	X	X						—
	11:45	SD-206		Soil	1								—
	12:00	SW-202		water	2			X	X				2
	12:08	SD-207		soil	1	X	X						—
	12:12	SD-208		soil	1	X	X						—
	~~12:45~~	~~SW-203~~		~~Soil~~ water SA	~~1~~ 2	X	X	X					
	12:45	SW-203	grab	water	2			X	X				3

	Date	Time	Received by:
Relinquished by:	4-21-05	1610	
Relinquished by: Sed Ex	4/22/05	0930	
Relinquished by:	Date	Time	Received by:

4/22/05

Spring Meadow Lake (SML)
Project or Site Name

S1129-30-SMLSRI
Project Number

Joe Faubion
Sampler Name (Printed)

Ed Surbrugg
Project Manager, Report to

CHAIN OF CUSTODY RECORD

NORTHERN
Analytical Laboratories, Inc.
602 South 25th Street
Billings, Montana 59101
Ph: 406-254-7226 • Fax: 406-254-1389
nlabs@wtp.net

Tetra Tech EMI
Report to (Firm or Agency)

7 west 6th Ave Suite 612
Address

Helena MT 59601
City State Zip

(406) 442-5588 (406) 442-7182
Phone Fax

DATE COLLECTED	TIME COLLECTED	SAMPLE LOCATION OR DESCRIPTION	COMP OR GRAB	SAMPLE MATRIX	NO. OF CONTAINERS	ANALYSIS REQUIRED: Field Parameters	ANALYSIS REQUIRED: Dissolved metals	NOTES	LAB NUMBER (2005 0410)
4-21-05	14:20	MW-02	grab	water	1	X		*Dissolved metal samples need filtering and preservation at the lab.	4
	14:22	MW-02		water	1		X		5
	15:15	MW-01		water	1	X			
	15:17	MW-01		water	1		X		
								MS #1	6
								MSD	7
								MB	8
								LCS	9

	Date	Time	Received by:
Relinquished by:	4-21-05	1610	
Relinquished by: Ed Surbrugg	4/22/05	0930	
Relinquished by:	Date	Time	Received by:

NORTHERN
Analytical Laboratories, Inc.

SAMPLE RECEIPT CHECKLIST

Dear Valued Client: This checklist documents the condition of your sample(s) as it (they) arrived at our lab. Please review it and familiarize yourself with its contents. Should you have any questions or comments, please contact us. Thank you for your use of our services.

Client Name: Tetra Tech

Project: Spring Meadows

Laboratory Number(s): 040192 & 193

Checklist Completed by: MW 4/22/05 (Initials / Date)

Date/Time Received: 4/22/05 0930 (Date / Time)

Received by: MW

Carrier Name: Fed Ex

Sample Type: Soil/H2O

	YES	NO
1. Shipping container in good condition?	✓	
2. Custody seals present on shipping container? Condition: Intact ✓ Broken ____	✓	
3. Chain of custody present?	✓	
4. Chain of custody signed when relinquished and received?	✓	
5. Chain of custody agrees with sample labels?	✓	
6. Custody seals on sample bottles? Condition: Intact ____ Broken ____		✓
7. Samples in proper container/bottle?*	✓	
8. Sample containers intact?*	✓	
9. Sufficient sample volume for indicated test?*	✓	
10. Ice/Frozen Blue Ice present in shipping container? (circle one) container temperature 1. 14.6°C 2. 2.0°C 3. _____ * (if <0 or>10)	✓	✓
11. All samples rec'd within holding time?*	✓	
12. VOA vials have zero headspace? * (if contains >5mm headspace)	NA	
13. Trip Blank received?		✓

	YES	NO
14. pH check performed by:	Teller & Pres	
15. Metals bottle(s) pH <2?	* in lab	
16. Nutrient bottle(s) pH <2?	NA	
17. Cyanide bottle(s) pH >12?		
18. Sulfide bottle(s) pH >9?		
19. TOC bottle(s) pH <2?		
20. Phenolics bottle(s) pH <2?		
21. Oil & grease bottle(s) pH <2? (checked by analyst)		
22. EPH/DRO bottle(s) pH <2? (checked by analyst)		
23. Volatiles (VOA) pH <2? (checked by analyst)		
24. Semivolatiles (525) pH <2? (checked by analyst)		
25. Other test types		
26. Client contacted?		
27. Person contacted		
28. Date contacted		

NOTES: **Samples may be affected when not transported at the temperature recommended by the EPA for the test you've selected. Please contact the lab if you have concerns about the temperature of your samples.**

* **Critical item - if marked "NO" contact lab manager.**

COMMENTS: _____

NORTHERN
Analytical Laboratories, Inc.

RECEIVED
AUG 26 2005
Dept. of Environmental Quality
Remediation Division

602 South 25th Street
P. O. Box 30315
Billings, Montana 59107
(406)254-7226
FAX (406)254-1389

FAX TRANSMITTAL

PLEASE DELIVER TO: John Koerth

COMPANY: MDEQ

FAX NUMBER: 406-841-5050

FROM: Denise Jensen

DATE 8-26-05 # OF PAGES 4 (including this page)

If there are any problems receiving this fax, contact:
Norma at (406) 254-7226

MESSAGE:

Following are the results of the sediment analysis for the Spring Meadow samples. A final report will be mailed on Mon.

SENT BY: _____ DATE & TIME _____

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: NONE GIVEN

Project Name: SPRING MEADOW BUGS & SEDIMENT

Sample No.: 2005070142-4 **Description:** SML 301 SD **Matrix:** SEDIMENT

Date Received: 07/13/2005

Date Collected: 06/24/2005 **Collected by:** JOHN KOERTH

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
METALS				
Antimony Dry Basis	<5	mg/kg	6020	08/26/2005
Arsenic Dry Basis	15	mg/kg	6010B	08/24/2005
Barium Dry Basis	36	mg/kg	6010B	08/24/2005
Cadmium Dry Basis	<2	mg/kg	6010B	08/24/2005
Chromium Dry Basis	6	mg/kg	6010B	08/24/2005
Copper Dry Basis	13	mg/kg	6010B	08/24/2005
Iron Dry Basis	7800	mg/kg	6010B	08/24/2005
Lead Dry Basis	27	mg/kg	6010B	08/24/2005
Manganese Dry Basis	122	mg/kg	6010B	08/24/2005
Zinc Dry Basis	46	mg/kg	6010B	08/24/2005
Thallium Dry Basis	<10	mg/kg	6010B	08/24/2005
ICP/AA Batch#/Digest Date	1558	---	3050B-M	08/24/2005
ICPMS Batch#/Digest Date	1559	---	3050B-SB	08/24/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: NONE GIVEN

Project Name: SPRING MEADOW BUGS & SEDIMENT

Sample No.: 2005070142-5 **Description:** SML 302 SD **Matrix:** SEDIMENT

Date Received: 07/13/2005

Date Collected: 06/24/2005 **Collected by:** JOHN KOERTH

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
METALS				
Antimony Dry Basis	<5	mg/kg	6020	08/26/2005
Arsenic Dry Basis	50	mg/kg	6010B	08/24/2005
Barium Dry Basis	55	mg/kg	6010B	08/24/2005
Cadmium Dry Basis	<2	mg/kg	6010B	08/24/2005
Chromium Dry Basis	14	mg/kg	6010B	08/24/2005
Copper Dry Basis	20	mg/kg	6010B	08/24/2005
Iron Dry Basis	16100	mg/kg	6010B	08/24/2005
Lead Dry Basis	53	mg/kg	6010B	08/24/2005
Manganese Dry Basis	930	mg/kg	6010B	08/24/2005
Zinc Dry Basis	88	mg/kg	6010B	08/24/2005
Thallium Dry Basis	<10	mg/kg	6010B	08/24/2005
ICP/AA Batch#/Digest Date	1558	-----	3050B-M	08/24/2005
ICPMS Batch#/Digest Date	1559	-----	3050B-SB	08/24/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: NONE GIVEN

Project Name: SPRING MEADOW BUGS & SEDIMENT

Sample No.: 2005070142-6 **Description:** SML 303 SD **Matrix:** SEDIMENT

Date Received: 07/13/2005

Date Collected: 06/24/2005 **Collected by:** JOHN KOERTH

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
METALS				
Antimony Dry Basis	<5	mg/kg	6020	08/26/2005
Arsenic Dry Basis	17	mg/kg	6010B	08/24/2005
Barium Dry Basis	41	mg/kg	6010B	08/24/2005
Cadmium Dry Basis	<2	mg/kg	6010B	08/24/2005
Chromium Dry Basis	6	mg/kg	6010B	08/24/2005
Copper Dry Basis	15	mg/kg	6010B	08/24/2005
Iron Dry Basis	8420	mg/kg	6010B	08/24/2005
Lead Dry Basis	28	mg/kg	6010B	08/24/2005
Manganese Dry Basis	156	mg/kg	6010B	08/24/2005
Zinc Dry Basis	47	mg/kg	6010B	08/24/2005
Thallium Dry Basis	<10	mg/kg	6010B	08/24/2005
ICP/AA Batch#/Digest Date	1558	----	3050B-M	08/24/2005
ICPMS Batch#/Digest Date	1559	----	3050B-SB	08/24/2005

NORTHERN
Analytical Laboratories, Inc.

602 South 25th Street
P O Box 30315
Billings, MT 59101
Telephone: (406) 254-7226
Fax: (406) 254-1389

REPORT TO: ATTN: JOHN KOERTH
MONTANA DEPT. OF ENVIRONMENTAL QUALITY
P.O. BOX 200901
HELENA, MT 59620-0901

DATE: August 25, 2005
JOB NUMBER: 90-933-14
PAGE: 1 of 7
INVOICE NO.: 5070142

REPORT OF: Soil/Biota Analysis – Spring Meadow Bugs & Sediment

---

CASE NARRATIVE:

On July 13, 2005 these soil and biota samples (laboratory numbers 2005070142-1 through -6) were received in our laboratory for analysis. Tests were conducted in accordance with SW-846 *"Test Methods for Evaluating Solid Waste"*, 3rd Edition, updates I, II, IIA, IIB, III. The results of the sediment analysis will be reported under a separate cover when completed.

The results of the analysis are shown on the following pages. A < sign indicates the value reported was the practical quantitation limit for this sample using the method described. Concentrations of analyte, if present, below this were not quantifiable. Sample results are not corrected for analyte blank concentrations. Values in brackets are the quality control limits for the associated quality control test.

The condition of the samples upon receipt at the laboratory is noted on the attached sample receipt checklist. Chain of custody documentation is enclosed.

Reviewed by _____
Sara Sanderson - Project Manager

Attachments: Chain of Custody
Sample Receipt Checklist

nct

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: NONE GIVEN

Project Name: SPRING MEADOW BUGS & SEDIMENT

Sample No.: 2005070142-1 **Description:** SML 301 BUGS **Matrix:** -----

Date Received: 07/13/2005

Date Collected: 06/24/2005 **Collected by:** JOHN KOERTH

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<0.4	mg/kg	6020	08/17/2005
Arsenic Dry Basis	0.6	mg/kg	6020	08/17/2005
Barium Dry Basis	2	mg/kg	6020	08/17/2005
Cadmium Dry Basis	0.07	mg/kg	6020	08/17/2005
Chromium Dry Basis	<0.6	mg/kg	6020	08/17/2005
Copper Dry Basis	4.4	mg/kg	6020	08/17/2005
Iron Dry Basis	1080	mg/kg	6010B	08/05/2005
Lead Dry Basis	1	mg/kg	6020	08/17/2005
Manganese Dry Basis	17	mg/kg	6020	08/19/2005
Zinc Dry Basis	12	mg/kg	6020	08/17/2005
Thallium Dry Basis	<0.1	mg/kg	6020	08/19/2005
ICPMS Batch#/Digest Date	1538	-----	3050B-M	08/15/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: NONE GIVEN

Project Name: SPRING MEADOW BUGS & SEDIMENT

Sample No.: 2005070142-2 **Description:** SML 302 BUGS **Matrix:** -----

Date Received: 07/13/2005

Date Collected: 06/24/2005 **Collected by:** JOHN KOERTH

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<0.4	mg/kg	6020	08/17/2005
Arsenic Dry Basis	3.9	mg/kg	6020	08/17/2005
Barium Dry Basis	5.5	mg/kg	6020	08/17/2005
Cadmium Dry Basis	0.09	mg/kg	6020	08/17/2005
Chromium Dry Basis	<0.6	mg/kg	6020	08/17/2005
Copper Dry Basis	3.0	mg/kg	6020	08/17/2005
Iron Dry Basis	1820	mg/kg	6010B	08/05/2005
Lead Dry Basis	6.2	mg/kg	6020	08/17/2005
Manganese Dry Basis	303	mg/kg	6020	08/19/2005
Zinc Dry Basis	17	mg/kg	6020	08/17/2005
Thallium Dry Basis	<0.1	mg/kg	6020	08/19/2005
ICPMS Batch#/Digest Date	1538	-----	3050B-M	08/15/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: NONE GIVEN

Project Name: SPRING MEADOW BUGS & SEDIMENT

Sample No.: 2005070142-3 **Description:** SML 303 BUGS **Matrix:** -----

Date Received: 07/13/2005

Date Collected: 06/24/2005 **Collected by:** JOHN KOERTH

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<0.4	mg/kg	6020	08/17/2005
Arsenic Dry Basis	2.6	mg/kg	6020	08/17/2005
Barium Dry Basis	3.3	mg/kg	6020	08/17/2005
Cadmium Dry Basis	<0.06	mg/kg	6020	08/17/2005
Chromium Dry Basis	<0.6	mg/kg	6020	08/17/2005
Copper Dry Basis	4.5	mg/kg	6020	08/17/2005
Iron Dry Basis	800	mg/kg	6010B	08/05/2005
Lead Dry Basis	1	mg/kg	6020	08/17/2005
Manganese Dry Basis	98	mg/kg	6020	08/19/2005
Zinc Dry Basis	14	mg/kg	6020	08/17/2005
Thallium Dry Basis	<0.1	mg/kg	6020	08/19/2005
ICPMS Batch#/Digest Date	1538	-----	3050B-M	08/15/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: NONE GIVEN

Project Name: SPRING MEADOW BUGS & SEDIMENT

Sample No.: 2005070142-9 **Description:** METHOD BLANK **Matrix:** WATER

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	<0.003	mg/l	6020	08/17/2005
Arsenic Dry Basis	<0.003	mg/l	6020	08/17/2005
Barium Dry Basis	<0.01	mg/l	6020	08/17/2005
Cadmium Dry Basis	<0.0005	mg/l	6020	08/17/2005
Chromium Dry Basis	<0.005	mg/l	6020	08/17/2005
Copper Dry Basis	<0.005	mg/l	6020	08/17/2005
Iron Dry Basis	<0.05	mg/l	6010B	08/05/2005
Lead Dry Basis	<0.003	mg/l	6020	08/17/2005
Manganese Dry Basis	<0.005	mg/l	6020	08/19/2005
Zinc Dry Basis	<0.01	mg/l	6020	08/17/2005
Thallium Dry Basis	<0.001	mg/l	6020	08/19/2005
ICPMS Batch#/Digest Date	1538	-----	3050B-M	08/15/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: NONE GIVEN

Project Name: SPRING MEADOW BUGS & SEDIMENT

Sample No.: 2005070142-10 **Description:** LABORATORY CONTROL SAMPLE **Matrix:** WATER

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	87	% [80-120]	6020	08/17/2005
Arsenic Dry Basis	90	% [80-120]	6020	08/17/2005
Barium Dry Basis	96	% [80-120]	6020	08/17/2005
Cadmium Dry Basis	88	% [80-120]	6020	08/17/2005
Chromium Dry Basis	86	% [80-120]	6020	08/17/2005
Copper Dry Basis	96	% [80-120]	6020	08/17/2005
Iron Dry Basis	98	% [80-120]	6010B	08/05/2005
Lead Dry Basis	84	% [80-120]	6020	08/17/2005
Manganese Dry Basis	94	% [80-120]	6020	08/19/2005
Zinc Dry Basis	83	% [80-120]	6020	08/17/2005
Thallium Dry Basis	82	% [80-120]	6020	08/19/2005
ICPMS Batch#/Digest Date	1538	-----	3050B-M	08/15/2005

Northern Analytical Laboratories, Inc.

Client Name: MT DEPT OF ENVIROMENTAL QUALITY

Project No.: NONE GIVEN

Project Name: SPRING MEADOW BUGS & SEDIMENT

Sample No.: 2005070142-11 **Description:** SAMPLE DUPLICATE **Matrix:** -----

Date Received: -----

Date Collected: ----- **Collected by:** PREPARED BY LAB

Laboratory Test	Measured Value	Test Units	Test Method	Date of Analysis
TARGET ANALYTE LIST (SOIL)				
Antimony Dry Basis	0	RPD [0-20]	6020	08/17/2005
Arsenic Dry Basis	0	RPD [0-20]	6020	08/17/2005
Barium Dry Basis	6	RPD [0-20]	6020	08/17/2005
Cadmium Dry Basis	0	RPD [0-20]	6020	08/17/2005
Chromium Dry Basis	0	RPD [0-20]	6020	08/17/2005
Copper Dry Basis	2	RPD [0-20]	6020	08/17/2005
Iron Dry Basis	NA	-----	-----	-----
Lead Dry Basis	1	RPD [0-20]	6020	08/17/2005
Manganese Dry Basis	1	RPD [0-20]	6020	08/19/2005
Zinc Dry Basis	16	RPD [0-20]	6020	08/17/2005
Thallium Dry Basis	0	RPD [0-20]	6020	08/19/2005
ICPMS Batch#/Digest Date	1538	-----	3050B-M	08/15/2005

Chain of Custody and Analytical Request Record

Page ____ of ____

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

ENERGY LABORATORIES

Company Name: DEQ ~~MT FISH WILDLIFE + PARKS~~	Project Name, PWS #, Permit #, Etc.: SPRING MEADOW BUGS + SEDIMENT
Report Mail Address: ~~1420 E 6TH AVE~~ HELENA ~~MT~~ 59620	Contact Name, Phone, Fax, E-mail: ~~DON SKAAR~~ JOHN KOOTH — Sampler Name if other than Contact:
Invoice Address:	Invoice Contact & Phone #: — Purchase Order #: — ELI Quote #:

Report Required For: POTW/WWTP ☐ DW ☐ Other _____

Special Report Formats - ELI must be notified prior to sample submittal for the following:

NELAC ☐ A2LA ☐ Level IV ☐

Other _____

EDD/EDT ☐ Format _____

Number of Containers
Sample Type: A W S V B O
Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED

Normal Turnaround (TAT) ☐ RUSH Turnaround (TAT) ☐

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Comments: J B47 7/13/05

Shipped by: _____

Cooler ID(s) _____

Receipt Temp _____ ° C

Custody Seal Y N
Intact Y N
Signature Y N
Match

Lab ID: 2005070142

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Arsenic Spec	TAL Metals Bag attached	SEE ATTACHED	LABORATORY USE ONLY
1	SML 301 BUGS	62405				✓		-1
2	SML 302 BUGS	62405				✓		-2
3	SML 303 BUGS	62405				✓		-3
4	SML 301 SD	62405			✓			-4
5	SML 302 SD	62405			✓			-5
6	SML 303 SD	62405			✓			-6
7	MS				✓			-7
8	MSD				✓			8
9	MB					✓		9
10	LCS					✓		10
	LCS Dup					✓		11

Custody Record MUST be Signed

	Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
1	John Kooth	~~7/13/05~~			7/13/05 1230	
2						

Sample Disposal: Return to client: _____ Lab Disposal: _____

LABORATORY USE ONLY

Sample Type: _____ # of fractions _____

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

NORTHERN Analytical Laboratories, Inc.

SAMPLE RECEIPT CHECKLIST

Dear Valued Client: This checklist documents the condition of your sample(s) as it (they) arrived at our lab. Please review it and familiarize yourself with its contents. Should you have any questions or comments, please contact us. Thank you for your use of our services.

Client Name: MDEQ

Project: Spring Meadow / Smith #3

Laboratory Number(s): 200507014 2 / 143

Checklist Completed by: KJV 7/13/05 (Initials / Date)

Date/Time Received: 7/13/05 1230 (Date / Time)

Received by: KAF

Carrier Name: Hand

Sample Type: Soil / Biota / Water

	YES	NO
1. Shipping container in good condition?	✓	
2. Custody seals present on shipping container? Condition: Intact N/A Broken N/A		✓
3. Chain of custody present?	✓	
4. Chain of custody signed when relinquished and received?	✓	
5. Chain of custody agrees with sample labels?	✓	
6. Custody seals on sample bottles? Condition: Intact ~~N/A~~ Broken N/A		✓
7. Samples in proper container/bottle?*	✓	
8. Sample containers intact?*	✓	
9. Sufficient sample volume for indicated test?*	✓	
10. Ice/Frozen Blue Ice present in shipping container? (circle one) container temperature 1. 4.8 2. Room temp 3. * (if <0 or>10) - Cooler 1 Cooler 2 - water	✓	
11. All samples rec'd within holding time?*	✓	
12. VOA vials have zero headspace? * (if contains >5mm headspace)	N/A	
13. Trip Blank received?	N/A	

	YES	NO
14. pH check performed by: N/A		
15. Metals bottle(s) pH <2?	N/A	
16. Nutrient bottle(s) pH <2?		
17. Cyanide bottle(s) pH >12?		
18. Sulfide bottle(s) pH >9?		
19. TOC bottle(s) pH <2?		
20. Phenolics bottle(s) pH <2?		
21. Oil & grease bottle(s) pH <2? (checked by analyst)		
22. EPH/DRO bottle(s) pH <2? (checked by analyst)		
23. Volatiles (VOA) pH <2? (checked by analyst)		
24. Semivolatiles (525) pH <2? (checked by analyst)		
25. Other test types	✓	
26. Client contacted?		
27. Person contacted		
28. Date contacted		

NOTES: **Samples may be affected when not transported at the temperature recommended by the EPA for the test you've selected. Please contact the lab if you have concerns about the temperature of your samples.**

* **Critical item - if marked "NO" contact lab manager.**

COMMENTS: Containers for water are not preserved at the direction of lab manager - contents unknown

7/13/ KJV

State of Montana
Department of Public Health and Human Services
ENVIRONMENTAL LABORATORY
Cogswell Building, Rm B219, 1400 Broadway, PO BOX 4369, Helena MT 59604 Phone 444-2642

- RESULTS OF CHEMICAL ANALYSIS -

DON SKAAR
FISH WILDLIFE AND PARKS
1420 E 6TH AVE
HELENA. MT 59620

Acct #: B0000075
PWSID #:
Project ID:
Collected: 07/29/2005
Time: 15:30
By: DON SKAAR
Received Date: 7/29/2005
Matrix: Fish Tissue
Report Date: 08/08/2005

RECEIVED
AUG 11 2005
FISHERIES DIV.
FISH, WILDLIFE & PARK

Lab#: C0507-2539

Sample ID: SPG MEADOW BASS / FW & P

ANALYTE	RESULTS	UNITS	METHOD	DATE	ANALYST
Arsenic	0.60	mg/kg	EPA 200.9	08/05/05	crs
Microwave Digestion	completed		EPA 3051	08/03/05	gal
Percent Moisture	79.0	%		08/03/05	gal

Reviewed by: _____

FLAGS: < = less-than
> = greater-than
* = holding time exceeded

H = above EPA limit for drinking water

State of Montana
Department of Public Health and Human Services
ENVIRONMENTAL LABORATORY

Cogswell Building, Rm B219, 1400 Broadway, PO BOX 4369, Helena MT 59604 Phone 444-2642

- RESULTS OF CHEMICAL ANALYSIS -

DON SKAAR
FISH WILDLIFE AND PARKS
1420 E 6TH AVE
HELENA. MT 59620

Acct #: B0000075
PWSID #:
Project ID:
Collected: 07/29/2005
Time: 15:30
By: DON SKAAR
Received Date: 7/29/2005
Matrix: Fish Tissue
Report Date: 08/08/2005

Lab#: C0507-2540

Sample ID: SPG MEADOW PUMPKINSEED / FW & P

ANALYTE	RESULTS	UNITS	METHOD	DATE	ANALYST
Arsenic	0.30	mg/kg	EPA 200.9	08/05/05	crs
Microwave Digestion	completed		EPA 3051	08/03/05	gal
Percent Moisture	76.9	%		08/03/05	gal

Reviewed by:

FLAGS: < = less-than
> = greater-than
* = holding time exceeded

H = above EPA limit for drinking water

SPRING & MEADOW 7-29-05

BASS

L	W	
11.6	.87	U ♂
11.2	.68	U ♂
10.6	.69	U ♂
9.5	.52	U ♂
9.4	.46	U ♂

PUMPKINSEED

L	W	
6.7	.31	U ♂ - SPAWN OUT
6.1	.22	U ♂
5.4	.16	G ♂
5.3	.13	G ♂
4.6	.10	U ♂

APPENDIX 5-C

RISK ASSESSMENT SPREADSHEETS AND DATA

SPRING MEADOW LAKE SITE

Surface/Subsurface Solid Matrix and Sediment Metal Concentrations (mg/kg)

Sample #		Depth (in)	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
Residential PRGs			**31**	**40**	**5400**	**37**	**210**	**3100**	**23000**	**400**	**1800**	**0**	**1600**	**390**	**23000**
TP	151	0-6	< 5	219	112	2	12	29	18300	154	3750	< 0.5	6	< 5	356
TP	152	0-8	< 5	54	56	< 10	74	17	94400	140	2240	< 0.5	9	< 25	81
TP	153 A	0-6	< 5	329	102	3	26	45	33200	247	4620	< 0.5	8	< 5	345
TP	153 B	18-24	< 5	< 50	71	< 10	52	18	62500	89	1490	< 0.5	7	< 25	106
TP	154 A	8-18	22	879	264	8	31	144	25000	998	41400	0.5	8	14	1460
TP	154 B	60-66	< 5	44	31	< 2	10	15	14200	72	446	< 0.5	< 5	< 5	77
TP	155 A	0-4	17	434	289	5	33	126	20000	677	41700	< 0.5	6	12	1260
TP	155 B	18-24	< 5	37	80	< 2	16	24	21100	75	425	< 0.5	10	< 5	87
TP	156 A	10-12	< 5	101	85	< 2	11	35	17000	83	1070	< 0.5	8	< 5	116
TP	156 B	36-42	9	624	224	6	12	77	18000	572	5340	0.6	8	< 5	908
TP	157 A	4-6	< 5	180	149	3	11	37	16600	146	3030	< 0.5	10	< 5	530
TP	157 B	24-36	< 5	45	133	< 2	13	20	17700	37	292	< 0.5	9	< 5	62
TP	158 A	6-9	22	1460	422	17	35	218	15600	1310	111000	0.6	< 5	27	3380
TP	158 B	28-32	< 5	62	75	< 2	14	24	17600	76	1420	< 0.5	7	< 5	109
TP	159 A	4-6	15	1290	232	17	16	123	18000	926	29100	< 0.5	6	13	2260
TP	160 A	4-6	61	5400	465	41	28	377	24000	3330	85500	0.9	< 5	50	5730
TP	161 A	0-6	13	804	106	8	14	74	17400	614	12100	< 0.5	< 5	6	841
TP	162 A	0-2	7	126	150	2	16	61	18600	269	15000	< 0.5	< 5	< 5	603
TP	162 B	36-42	< 5	100	161	< 2	19	73	24500	115	1730	0.6	15	< 5	187
TP	163 A	0-6	< 5	172	155	< 2	11	113	19400	189	5220	< 0.5	10	< 5	274
TP	164 A	0-4	23	754	539	12	40	241	15200	1220	122000	0.5	< 5	30	2680
TP	164 B	16-24	6	461	196	8	17	104	29700	373	4230	< 0.5	12	< 5	1260
TP	165 A	4-6	6	502	136	4	18	66	22900	389	12200	< 0.5	6	< 5	566
TP	166 A	0-4	12	570	194	5	14	102	15800	537	27900	< 0.5	< 5	8	1130
TP	166 B	12-18	< 5	26	44	< 2	5	< 10	7840	20	347	< 0.5	< 5	< 5	36
TP	167 A	14-20	93	10400	494	13	18	265	22400	6180	53200	0.6	< 5	54	2490
TP	167 B	22-24	< 5	101	57	< 2	12	25	15600	82	1210	< 0.5	< 5	< 5	97
TP	168 A	2-6	< 5	37	50	< 2	11	19	15600	37	338	< 0.5	8	< 5	62
TP	168 B	18-24	< 5	21	58	< 2	8	12	13200	30	644	< 0.5	< 5	< 5	48
TP	168 C	26-60	< 5	110	123	< 2	13	49	21500	108	1030	< 0.5	10	< 5	136
TP	169 A	0-6	11	781	202	6	13	103	19100	590	24700	< 0.5	7	7	1050
TP	169 B	6-18	10	609	200	5	15	92	21300	496	22800	< 0.5	7	5	911
TP	170 A	4-6	< 5	< 10	46	< 2	13	19	16300	18	340	< 0.5	7	< 5	52
TP	170 B	20-28	47	< 50	78	< 10	32	99	103000	567	952	< 0.5	22	< 25	78
TP	170 C	32-38	< 5	61	140	< 2	10	29	14900	60	444	< 0.5	7	< 5	83
TP	171 A	2-12	280	33700	581	78	17	1290	61200	16300	60000	2.1	< 5	106	5940
TP	171 B	12-20	< 5	59	98	< 10	21	46	71900	60	1260	< 0.5	17	< 25	92
TP	171 C	30-36	< 5	43	142	< 2	12	24	16400	31	305	< 0.5	9	< 5	53
TP	172 A	18-20	< 5	30	64	< 2	10	21	15000	52	333	< 0.5	6	< 5	76
TP	173 A	0-9	9	158	773	14	48	350	18000	1290	224000	< 0.5	< 5	31	3370
TP	173 B	10-20	21	1240	343	246	24	253	53100	3010	36900	0.7	11	15	48400
TP	173 C	22-24	< 5	54	172	< 2	10	22	15000	27	448	< 0.5	9	< 5	93
TP	174 A	0-8	< 5	76	180	4	17	53	19300	298	18000	< 0.5	9	< 5	1050
TP	174 B	14-16	< 5	65	79	< 2	11	24	17800	55	391	< 0.5	8	< 5	80
TP	174 C	18-20	< 5	11	79	< 2	10	65	32600	84	396	< 0.5	12	< 5	69
TP	174 D	30-32	< 5	39	127	< 2	13	22	18200	33	407	< 0.5	9	< 5	89
Sediment Goals			**2.9**	**19**		**7.5**				**240**	**1400**	**0.16**	**39**		**500**
SD	201	0-2	< 5	95	77	< 2	8	25	10800	135	3650	< 0.5	< 5	< 5	198
SD	202	0-2	< 5	34	54	< 2	7	19	9550	53	384	< 0.5	< 5	< 5	83
SD	203	0-2	< 5	19	52	< 2	10	15	9840	64	159	< 0.5	< 5	< 5	82
SD	204	0-2	< 5	32	116	< 2	10	42	9560	163	586	< 0.5	< 5	< 5	218
SD	205	0-2	< 5	31	120	< 2	10	38	14300	130	323	< 0.5	7	< 5	185
SD	206	0-2	< 5	20	98	< 2	6	24	6420	70	173	< 0.5	< 5	< 5	93
SD	207	0-2	< 5	105	121	< 2	5	39	6940	70	814	< 0.5	< 5	< 5	314
SD	208	0-2	< 5	110	130	6	13	78	14800	319	1370	0.6	7	< 5	619
SML	301	0-4	< 5	15	36	< 2	6	13	7800	27	122	NA	NA	NA	46
SML	302	0-4	< 5	50	55	< 2	14	20	16100	53	930	NA	NA	NA	88
SML	303	0-4	< 5	17	41	< 2	6	15	8420	28	156	NA	NA	NA	47

Notes:

Sb = Antimony; As = Arsenic; Ba = Barium; Cd = Cadmium; Cr = Chromium; Cu = Copper
Fe = Iron; Pb = Lead; Hg = Mercury; Ni = Nickel; Ag = Silver; Zn = Zinc

TP Test Pit

SD Sediment

NA Not Analyzed For

SPRING MEADOW LAKE SITE

Surface Water (SW) and Groundwater (MW) Metal Concentrations (mg/L)

		Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
WQB-7 Total		**0.006**	**0.018**	**2.000**	**0.005**	**0.100**	**1.300**	**0.300**	**0.015**	**0.050**	**5E-05**	**0.100**	**0.100**	**2.000**
SW	201	< 0.003	0.012	0.029	< 0.0001	<0.001	< 0.001	0.02	< 0.003	< 0.005	< 0.0006	< 0.02	< 0.003	< 0.01
SW	202	< 0.003	0.012	0.037	< 0.0001	<0.001	< 0.001	< 0.02	< 0.003	0.011	< 0.0006	< 0.02	< 0.003	< 0.01
SW	203	< 0.003	0.032	0.009	< 0.0001	<0.001	< 0.001	0.06	< 0.003	0.051	< 0.0006	< 0.02	< 0.003	< 0.01
WQB-7 Dis.		**0.006**	**0.020**	**2.000**	**0.005**	**0.100**	**1.300**	**0.300**	**0.015**	**0.050**	**0.002**	**0.100**	**0.100**	**2.000**
MW	1	< 0.003	0.029	0.041	0.0001	0.008	0.005	< 0.01	< 0.003	0.390	< 0.0006	< 0.02	< 0.003	< 0.01
MW	2	< 0.003	0.010	0.043	0.0004	0.008	0.002	< 0.01	< 0.003	0.007	< 0.0006	< 0.02	< 0.003	0.04

SPRING MEADOW LAKE SITE

Aquatic Invertebrates (Bugs) and Fish (Bass and Pumpkinseed) Metal Concentrations (mg/kg)

		Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
USDI 1998 [a]			**30-50**											
SML	301 Bugs	< 0.4	0.6	2	0.07	<0.6	4.4	1080	1	17	NA	NA	NA	12
SML	302 Bugs	< 0.4	3.9	5.5	0.09	<0.6	3	1820	6.2	303	NA	NA	NA	17
SML	303 Bugs	< 0.4	2.6	3.3	<0.06	<0.6	4.5	800	1	98	NA	NA	NA	14
Gilderhus 1966 [b]			**1 - 3**											
SPG Bass			0.60											
SPG Pumpkinseed			0.30											

Notes:

[a] USDI, 1998. Guidelines for Interpretation of the Biological Effects of Selected Constituents in Biota, Water, and Sediment – Arsenic

[b] Gilderhus, 1966. Some Effects of Sublethal Concentrations of Sodium Arsenite on Bluegills and the Aquatic Environment.

SPRING MEADOW LAKE SITE - East Arm Area

Surface/Subsurface Solid Matrix Metal Concentrations (mg/kg)

Sample #		Depth (in)	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
Residential PRGs			31	40	5400	37	210	3100	23000	400	1800	0	1600	390	23000
TP	151	0-6	< 5	219	112	2	12	29	18300	154	3750	< 0.5	6	< 5	356
TP	152	0-8	< 5	54	56	< 10	74	17	94400	140	2240	< 0.5	9	< 25	81
TP	153 A	0-6	< 5	329	102	3	26	45	33200	247	4620	< 0.5	8	< 5	345
TP	153 B	18-24	< 5	< 50	71	< 10	52	18	62500	89	1490	< 0.5	7	< 25	106
TP	154 A	8-18	22	879	264	8	31	144	25000	998	41400	0.5	8	14	1460
TP	154 B	60-66	< 5	44	31	< 2	10	15	14200	72	446	< 0.5	< 5	< 5	77
TP	155 A	0-4	17	434	289	5	33	126	20000	877	41700	< 0.5	6	12	1260
TP	155 B	18-24	< 5	37	80	< 2	16	24	21100	75	425	< 0.5	10	< 5	87
TP	156 A	10-12	< 5	101	85	< 2	11	35	17000	83	1070	< 0.5	8	< 5	116
TP	156 B	36-42	9	624	224	6	12	77	18000	572	5340	0.6	8	< 5	908
TP	157 A	4-6	< 5	180	149	3	11	37	16600	146	3030	< 0.5	10	< 5	530
TP	157 B	24-36	< 5	45	133	< 2	13	20	17700	37	292	< 0.5	9	< 5	62
TP	158 A	6-9	22	1460	422	17	35	218	15600	1310	111000	0.6	< 5	27	3380
TP	158 B	28-32	< 5	62	75	< 2	14	24	17600	76	1420	< 0.5	7	< 5	109
TP	159 A	4-6	15	1290	232	17	16	123	18000	926	29100	< 0.5	6	13	2260
TP	160 A	4-6	61	5400	465	41	28	377	24000	3330	85500	0.9	< 5	50	5730
TP	161 A	0-6	13	804	106	8	14	74	17400	614	12100	< 0.5	< 5	6	841
TP	162 A	0-2	7	126	150	2	16	61	18600	269	15000	< 0.5	< 5	< 5	603
TP	162 B	36-42	< 5	100	161	< 2	19	73	24500	115	1730	0.6	15	< 5	187
TP	163 A	0-6	< 5	172	155	< 2	11	113	19400	189	5220	< 0.5	10	< 5	274
TP	164 A	0-4	23	754	539	12	40	241	15200	1220	122000	0.5	< 5	30	2680
TP	164 B	16-24	6	461	196	8	17	104	29700	373	4230	< 0.5	12	< 5	1260
TP	165 A	4-6	6	502	136	4	18	66	22900	389	12200	< 0.5	6	< 5	566
TP	166 A	0-4	12	570	194	5	14	102	15800	537	27900	< 0.5	< 5	8	1130
TP	166 B	12-18	< 5	26	44	< 2	5	< 10	7840	20	347	< 0.5	< 5	< 5	36
TP	167 A	14-20	93	10400	494	13	18	265	22400	6180	53200	0.6	< 5	54	2490
TP	167 B	22-24	< 5	101	57	< 2	12	25	15600	82	1210	< 0.5	< 5	< 5	97
TP	168 A	2-6	< 5	37	50	< 2	11	19	15600	37	338	< 0.5	8	< 5	62
TP	168 B	18-24	< 5	21	58	< 2	8	12	13200	30	644	< 0.5	< 5	< 5	48
TP	168 C	26-60	< 5	110	123	< 2	13	49	21500	108	1030	< 0.5	10	< 5	136
TP	169 A	0-6	11	781	202	6	13	103	19100	590	24700	< 0.5	7	7	1050
TP	169 B	6-18	10	609	200	5	15	92	21300	496	22800	< 0.5	7	5	911
		SD	18.17	1994.6	134.78	7.6958	14.24	85.153	15860	1194.7	31882	0.0762	2.4363	12.891	1237.8
		alpha .05	5.252	576.4	38.95	2.2239	4.115	24.608	4583.2	345.25	9213.2	0.022	0.704	3.7253	357.7
		average	12.88	836.94	176.72	6.5313	19.938	85.563	22914	630.66	19921	0.525	7.25	11.594	913.69
		95%UCL	18.13	1413.3	215.67	8.7552	24.053	110.17	27497	975.91	29134	0.547	7.954	15.319	1271.4
		max	93	10400	539	41	74	377	94400	6180	122000	0.9	15	54	5730
		min	5	21	31	2	5	10	7840	20	292	0.5	5	5	36

SPRING MEADOW LAKE SITE - Montana Wildlife Center
Surface/Subsurface Solid Matrix Metal Concentrations (mg/kg)

Sample #	Depth (in)	Sb	As	Ba	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
Industrial Soil PRG		410	260	67,000	450	450	41,000	100,000	750	19,000	0	20,000	5,100	100,000
TP 170 A	4-6	< 5	< 10	46	< 2	13	19	16300	18	340	< 0.5	7	< 5	52
TP 170 B	20-28	47	< 50	78	< 10	32	99	103000	567	952	< 0.5	22	< 25	78
TP 170 C	32-38	< 5	61	140	< 2	10	29	14900	60	444	< 0.5	7	< 5	83
TP 171 A	2-12	280	33700	581	78	17	1290	61200	16300	60000	2.1	< 5	106	5940
TP 171 B	12-20	< 5	59	98	< 10	21	46	71900	60	1260	< 0.5	17	< 25	92
TP 171 C	30-36	< 5	43	142	< 2	12	24	16400	31	305	< 0.5	9	< 5	53
TP 172 A	18-20	< 5	30	64	< 2	10	21	15000	52	333	< 0.5	6	< 5	76
TP 173 A	0-9	9	158	773	14	48	350	18000	1290	224000	< 0.5	< 5	31	3370
TP 173 B	10-20	21	1240	343	246	24	253	53100	3010	36900	0.7	11	15	48400
TP 173 C	22-24	< 5	54	172	< 2	10	22	15000	27	448	< 0.5	9	< 5	93
TP 174 A	0-8	< 5	76	180	4	17	53	19300	298	18000	< 0.5	9	< 5	1050
TP 174 B	14-16	< 5	65	79	< 2	11	24	17800	55	391	< 0.5	8	< 5	80
TP 174 C	18-20	< 5	11	79	< 2	10	65	32600	84	396	< 0.5	12	< 5	69
TP 174 D	30-32	< 5	39	127	< 2	13	22	18200	33	407	< 0.5	9	< 5	89
	SD	73.14	8973.4	215.45	66.122	10.859	338.53	27731.2	4320.2	60131	0.4268	4.714	27.088	12822.1
	alpha .05	21.14	2593.1	62.262	19.108	3.138	97.83	8013.8	1248.5	17377	0.1234	1.362	7.8281	3705.34
	average	29.07	2542.6	207.29	27	17.714	165.5	33764.3	1563.2	24584	0.6286	9.714	17.643	4251.79
	95%UCL	50.21	5135.7	269.55	46.108	20.852	263.33	41778.1	2811.7	41961	0.7519	11.08	25.471	7957.12
	min	5	10	46	2	10	19	14900	18	305	0.5	5	5	52
	max	280	33700	773	246	48	1290	103000	16300	224000	2.1	22	106	48400

SPRING MEADOW LAKE SITE

Surface Solid Matrix (ONLY) Metal Concentrations (mg/kg)

Sample #			Depth (in)		Sb		As	Ba		Cd	Cr		Cu	Fe	Pb	Mn		Hg		Ni		Ag	Zn
Residential PRGs					31		40	5400		37	210		3100	23000	400	1800		0		1600		390	23000
TP	104	A	0-6				2910						224		2410	27300							3700
SS	206	A	0-2				2430						327		2160	176000							5020
SS	207	A	0-2				2200						312		2120	170000							4310
SS	216	A	0-6				1520						210		1340	70100							2640
SS	204	A	0-6				302						108		468	6180							1010
TP	151		0-6	<	5		219	112		2	12		29	18300	154	3750	<	0.5		6	<	5	356
TP	152		0-8	<	5		54	56	<	10	74		17	94400	140	2240	<	0.5		9	<	25	81
TP	153	A	0-6	<	5		329	102		3	26		45	33200	247	4620	<	0.5		8	<	5	345
TP	155	A	0-4		17		434	289		5	33		126	20000	677	41700	<	0.5		6		12	1260
TP	161	A	0-6		13		804	106		8	14		74	17400	614	12100	<	0.5	<	5		6	841
TP	162	A	0-2		7		126	150		2	16		61	18600	269	15000	<	0.5	<	5	<	5	603
TP	163	A	0-6	<	5		172	155	<	2	11		113	19400	189	5220	<	0.5		10	<	5	274
TP	164	A	0-4		23		754	539		12	40		241	15200	1220	122000		0.5	<	5		30	2680
TP	166	A	0-4		12		570	194		5	14		102	15800	537	27900	<	0.5	<	5		8	1130
TP	169	A	0-6		11		781	202		6	13		103	19100	590	24700	<	0.5		7		7	1050
TP	173	A	0-9		9		158	773		14	48		350	18000	1290	224000	<	0.5	<	5		31	3370
TP	174	A	0-8	<	5		76	180		4	17		53	19300	298	18000	<	0.5		9	<	5	1050
Average					9.75		814.06	238.17		6.0833	26.5		146.76	25725	866.06	55930		0.5		6.6667		12	1748.2
Maximum					23		2910	773		14	74		350	94400	2410	224000		0.5		10		31	5020
Minimum					5		54	56		2	11		17	15200	140	2240		0.5		5		5	81

Surface/Subsurface Solid Matrix and Sediment Metal Concentrations
(mg/kg) PA&RI

Sample #			PA or RI	Depth (in)	As	Cu	Mn	Pb	Zn
Residential PRGs					40	3100	1800	400	23000
Sediment Goals					19	840	1400	240	500
TP	153	B	RI	18-24	<50	18	1490	89	106
TP	170	B	RI	20-28	<50	99	952	567	78
TP	170	A	RI	4-6	<10	19	340	18	52
TP	109	C	PA	144	57500	3300	949	28600	29700
TP	111	A	PA	24	34200	905	1370	23100	10900
TP	171	A	RI	2-12	33700	1290	60000	16300	5940
TP	107	B	PA	48	27700	1390	21000	39000	18000
TP	106	A	PA	12	20700	220	8290	5220	4240
TP	167	A	RI	14-20	10400	265	53200	6180	2490
TP	119	A	PA	12	8980	443	111000	5840	6020
TP	115	B	PA	24	5890	516	43700	4260	2150
TP	160	A	RI	4-6	5400	377	66500	3330	5730
TP	126	B	PA	24	3280	232	120000	1920	4120
TP	120	A	PA	12	2920	390	220000	2480	5580
TP	104	A	PA	0-6	2910	224	27300	2410	3700
TP	104	B	PA	18	2640	240	34400	2320	3600
SS	206	A	PA	0-2	2430	327	176000	2160	5020
SS	207	A	PA	0-2	2200	312	170000	2120	4310
SS	216	A	PA	0-6	1520	210	70100	1340	2640
TP	158	A	RI	6-9	1460	218	111000	1310	3380
TP	159	A	RI	4-6	1290	123	29100	926	2260
TP	107	C	PA	60	1250	505	228000	2730	7940
TP	173	B	RI	10-20	1240	253	36900	3010	48400
TP	127	B	PA	24	1240	95	16800	690	1710
TP	116	C	PA	54	951	83	24500	915	1000
TP	154	A	RI	8-18	879	144	41400	998	1460
TP	161	A	RI	0-6	804	74	12100	614	841
TP	169	A	RI	0-6	781	103	24700	590	1050
TP	164	A	RI	0-4	754	241	122000	1220	2680
TP	156	B	RI	36-42	624	77	5340	572	908
TP	169	B	RI	6-18	609	92	22800	496	911
TP	166	A	RI	0-4	570	102	27900	537	1130
TP	165	A	RI	4-6	502	66	12200	389	566
TP	164	B	RI	16-24	461	104	4230	373	1260
TP	113	A	PA	12	451	175	1410	819	4180
TP	155	A	RI	0-4	434	126	41700	677	1260
TP	153	A	RI	0-6	329	45	4620	247	345
SS	204	A	PA	0-6	302	108	6180	468	1010
TP	120	B	PA	36	222	424	191000	1970	4280
TP	151		RI	0-6	219	29	3750	154	356
TP	157	A	RI	4-6	180	37	3030	146	530
TP	163	A	RI	0-6	172	113	5220	189	274
TP	127	C	PA	48	163	41	1250	95	172
TP	173	A	RI	0-9	158	350	224000	1290	3370
TP	162	A	RI	0-2	126	61	15000	269	603
SD	208	A	RI	0-2	110	78	1370	319	619
TP	168	C	RI	26-60	110	49	1030	108	136
SD	207	A	RI	0-2	106	39	814	70	314
TP	167	B	RI	22-24	101	25	1210	82	97
TP	156	A	RI	10-12	101	35	1070	83	116
TP	162	B	RI	36-42	100	73	1730	115	187
SD	201	A	RI	0-2	95	25	3650	135	198
TP	174	A	RI	0-8	76	53	18000	298	1050
TP	174	B	RI	14-16	65	24	391	55	80
TP	158	B	RI	28-32	62	24	1420	76	109
TP	170	C	RI	32-38	61	29	444	60	83
TP	171	B	RI	12-20	59	46	1260	60	92
TP	152		RI	0-8	54	17	2240	140	81
TP	173	C	RI	22-24	54	22	448	27	93
TP	157	B	RI	24-36	45	20	292	37	62
TP	154	B	RI	60-66	44	15	446	72	77
TP	171	C	RI	30-36	43	24	305	31	53
TP	174	D	RI	30-32	39	22	407	33	89
TP	155	B	RI	18-24	37	24	425	75	87
TP	168	A	RI	2-6	37	19	338	37	62
SD	202	A	RI	0-2	34	19	384	53	83
SD	204	A	RI	0-2	32	42	586	163	218
SD	205	A	RI	0-2	31	38	323	130	185
TP	172	A	RI	18-20	30	21	333	52	76
TP	166	B	RI	12-18	26	<10	347	20	36
TP	168	B	RI	18-24	21	12	644	30	48
SD	206	A	RI	0-2	20	24	173	70	93
SD	203	A	RI	0-2	19	15	159	64	82
TP	174	C	RI	18-20	11	65	396	84	69

Surface/Subsurface Solid Matrix and Sediment Metal Concentrations (mg/kg) PA&RI

Sample #			PA or RI	Depth (in)	As	Cu	Mn	Pb	Zn
Residential PRGs					**40**	**3100**	**1800**	**400**	**23000**
Sediment Goals					**19**	**840**	**1400**	**240**	**500**
TP	104	A	PA	0-6	2910	224	27300	2410	3700
SS	206	A	PA	0-2	2430	327	176000	2160	5020
SS	207	A	PA	0-2	2200	312	170000	2120	4310
SS	216	A	PA	0-6	1520	210	70100	1340	2640
SS	204	A	PA	0-6	302	108	6180	468	1010

CANCER RISKS VIA INGESTION OF SOIL
ON SITE WORKER SCENARIO

INPUT							
	Ingestion Rate (ING)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(mg/day)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	100	165	25	70	70	1E-06	365

INPUT				OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values		Average Exposure	
	Site Concentrations (mg/kg)		Slope Factor (mg/kg-day)-1	ADD (mg/kg-day)	Cancer Risk (CR)
RECREATIONAL SCENARIO					
Arsenic	5136.0		1.5	1.2E-03	1.8E-03
RECREATIONAL SCENARIO CR SUBTOTAL					1.8E-03

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

mg/day = milligrams per day

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

CANCER RISKS VIA INHALATION OF DUST
ON SITE WORKER SCENARIO

INPUT								
	Inhalation Rate (INH)	Particulate Concentration (PC)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(m3/day)	(mg/m3)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	20	0.00076	165	25	70	70	1E-06	365

INPUT				OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values		Average Exposure	
	Site Concentrations (mg/kg)		Slope Factor (mg/kg-day)-1	ADD (mg/kg-day)	Cancer Risk (CR)
RECREATIONAL SCENARIO					
Arsenic	5136.0		15	1.8E-07	2.7E-06
RECREATIONAL SCENARIO CR SUBTOTAL					2.7E-06

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

Particulate concentration is equal to a particulate emmision factor of 1.1E+9 m^3/kg

m3/day = cubic meters per day

mg/m3 = milligrams per cubic meter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

CANCER RISKS VIA DERMAL CONTACT WITH SOIL
ON SITE WORKER SCENARIO

INPUT								
	Surface Area (SA)	Adherence Factor (AF)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(cm2/day)	(mg/cm2)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	5,700	0.15	165	25	70	70	1E-06	365

INPUT					OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Absorption Factor (ABS)	Toxicity Values		Average Exposure	
	Site Concentrations (mg/kg)	(percent)		Slope Factor (mg/kg-day)-1	ADD (mg/kg-day)	Cancer Risk (CR)
RECREATIONAL SCENARIO						
Arsenic	5136.0	0.03		1.5	3.0E-04	4.6E-04
RECREATIONAL SCENARIO CR SUBTOTAL						4.6E-04

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

cm2/day = square centimeters per day

mg/cm2 = milligrams per square centimeter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

ON SITE WORKER SCENARIO
PATHWAY-SPECIFIC AND CHEMICAL-SPECIFIC CANCER RISK

INPUT				OUTPUT
	Cancer Risk - Recreational Scenario			***Chemical-Specific Cancer Risk***
	Ingestion of Soil	Inhalation of Dust	Dermal Contact with Soil	
Chemicals of Potential Concern	Exposure Risk	Exposure Risk	Exposure Risk	Total Exposure Risk
Arsenic	1.8E-03	2.7E-06	4.6E-04	2.2E-03
Pathway-Specific Cancer Risk:	1.8E-03	2.7E-06	4.6E-04	2.2E-03
				Recreational Scenario Cummulative Cancer Risk

HAZARD QUOTIENTS VIA INGESTION OF SOIL
ON SITE WORKER SCENARIO

INPUT							
	Ingestion Rate (ING)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(mg/day)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	100	165	25	70	25	1E-06	365

INPUT			OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values	Average Exposure	
	Site Concentrations (mg/kg)	Reference Dose (mg/kg-day)	ADD (mg/kg-day)	Hazard Quotient (HQ)
RECREATIONAL SCENARIO				
Arsenic	5136.0	0.0003	3.3E-03	1.1E+01
RECREATIONAL SCENARIO HQ SUBTOTAL				1.1E+01

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

mg/day = milligrams per day

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

HAZARD QUOTIENTS VIA INHALATION OF DUST
ON SITE WORKER SCENARIO

INPUT								
	Inhalation Rate (INH)	Particulate Concentration (PC)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(m3/day)	(mg/m3)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	20	0.00076	165	25	70	25	1E-06	365

INPUT			OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values	Average Exposure	
	Site Concentrations (mg/kg)	Reference Dose (mg/kg-day)	ADD (mg/kg-day)	Hazard Quotient (HQ)
RECREATIONAL SCENARIO				
Arsenic	5136.0	NA	5.0E-07	NA
RECREATIONAL SCENARIO HQ SUBTOTAL				NA

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

m3/day = cubic meters per day

mg/m3 = milligrams per cubic meter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

HAZARD QUOTIENTS VIA DERMAL CONTACT WITH SOIL
ON SITE WORKER SCENARIO

INPUT								
	Surface Area (SA)	Adherence Factor (AF)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(cm2/day)	(mg/cm2)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	5,700	0.15	165	25	70	25	1E-06	365

INPUT				OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS) Site Concentrations (mg/kg)	Absorption Factor (ABS) (percent)	Toxicity Values Reference Dose (mg/kg-day)	Average Exposure ADD (mg/kg-day)	Average Exposure Hazard Quotient (HQ)
RECREATIONAL SCENARIO					
Arsenic	5136.0	0.03	0.0003	8.5E-04	2.8E+00
RECREATIONAL SCENARIO HQ SUBTOTAL					2.8E+00

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

cm2/day = square centimeters per day
mg/cm2 = milligrams per square centimeter
kg = kilograms
kg/mg = kilograms per milligram
mg/kg = milligrams per kilogram
mg/kg-day = milligrams per kilogram per day

ON SITE WORKER SCENARIO
PATHWAY-SPECIFIC AND CHEMICAL-SPECIFIC HAZARD INDICES

INPUT				OUTPUT
	Hazard Quotient - Recreational Scenario			***Chemical-Specific Hazard Index***
	Ingestion of Soil	Inhalation of Dust	Dermal Contact with Soil	
Chemicals of Potential Concern	Exposure Risk	Exposure Risk	Exposure Risk	Total Exposure Risk
Arsenic	1.1E+01	0.0E+00	2.8E+00	1.4E+01
Pathway-Specific Hazard Index:	1.1E+01	0.0E+00	2.8E+00	1.4E+01
				Recreational Scenario Cummulative Hazard Index

SPRING MEADOW LAKE SITE

LEAD RISK ASSESSMENT SPREADSHEET

10/12/2005

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

USER'S GUIDE to version 7

INPUT	
MEDIUM	LEVEL
Lead in Air (ug/m^3)	0.028
Lead in Soil/Dust (ug/g)	976.0
Lead in Water (ug/l)	5
% Home-grown Produce	0%
Respirable Dust (ug/m^3)	0.76

OUTPUT							
	Percentile Estimate of Blood Pb (ug/dl)					PRG-99	PRG-95
	50th	90th	95th	98th	99th	(ug/g)	(ug/g)
BLOOD Pb, ADULT	0.6	1.2	1.4	1.7	1.9	21482	31214
BLOOD Pb, CHILD	1.5	2.8	3.3	4.0	4.5	3684	5586
BLOOD Pb, PICA CHILD	1.8	3.4	4.0	4.9	5.5	2456	3724
BLOOD Pb, OCCUPATIONAL	1.3	2.4	2.8	3.4	3.9	3560	5182

EXPOSURE PARAMETERS			
	units	adults	children
Days per week	days/wk	0.5	
Days per week, occupational		3	
Geometric Standard Deviation		1.6	
Blood lead level of concern (ug/dl)		10	
Skin area, residential	cm^2	5700	3700
Skin area occupational	cm^2	5700	
Soil adherence	ug/cm^2	150	200
Dermal uptake constant	(ug/dl)/(ug/d	0.0001	
Soil ingestion	mg/day	100	133
Soil ingestion, pica	mg/day		200
Ingestion constant	(ug/dl)/(ug/d	0.04	0.16
Bioavailability	unitless	0.44	
Breathing rate	m^3/day	20	4.8
Inhalation constant	(ug/dl)/(ug/d	0.082	0.192
Water ingestion	l/day	1.4	0.4
Food ingestion	kg/day	1.9	1.1
Lead in market basket	ug/kg	3.1	
Lead in home-grown produce	ug/kg	0.0	

Click here for REFERENCES

PATHWAYS						
ADULTS	Residential			Occupational		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.9E-6	0.01	1%	3.5E-5	0.03	3%
Soil Ingestion	1.3E-4	0.12	19%	7.5E-4	0.74	56%
Inhalation, bkgrnd		0.00	1%		0.02	2%
Inhalation	8.9E-8	0.00	0%	5.3E-7	0.00	0%
Water Ingestion		0.28	43%		0.28	21%
Food Ingestion, bkgrnd		0.23	36%		0.23	18%
Food Ingestion	0.0E+0	0.00	0%			0%

CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.1E-6	0.00	0%		0.00	0%
Soil Ingestion	6.7E-4	0.65	43%	1.0E-3	0.98	53%
Inhalation	5.0E-8	0.00	0%		0.00	0%
Inhalation, bkgrnd		0.00	0%		0.00	0%
Water Ingestion		0.32	21%		0.32	17%
Food Ingestion, bkgrnd		0.54	36%		0.54	29%
Food Ingestion	0.0E+0	0.00	0%		0.00	0%

CANCER RISKS VIA INGESTION OF SOIL
RECREATIONAL SCENARIO - ADULT

INPUT							
	Ingestion Rate (ING)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(mg/day)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	100	20	24	52	70	1E-06	365

INPUT				OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values		Average Exposure	
	Site Concentrations (mg/kg)		Slope Factor (mg/kg-day)-1	ADD (mg/kg-day)	Cancer Risk (CR)
RECREATIONAL SCENARIO					
Arsenic	1413.0		1.5	5.1E-05	7.7E-05
RECREATIONAL SCENARIO CR SUBTOTAL					7.7E-05

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

mg/day = milligrams per day

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

CANCER RISKS VIA INHALATION OF DUST
RECREATIONAL SCENARIO - ADULT

INPUT								
Recreational Scenario	Inhalation Rate (INH) (m3/day)	Particulate Concentration (PC) (mg/m3)	Exposure Frequency (EF) (days/year)	Exposure Duration (ED) (years)	Body Weight (BW) (kg)	Averaging Time (AT) (years)	Conversion Factors	
							Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	20	0.00076	20	24	52	70	1E-06	365

INPUT				OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values		Average Exposure	
	Site Concentrations (mg/kg)		Slope Factor (mg/kg-day)-1	ADD (mg/kg-day)	Cancer Risk (CR)
RECREATIONAL SCENARIO					
Arsenic	1413.0		15	7.8E-09	1.2E-07
RECREATIONAL SCENARIO CR SUBTOTAL					1.2E-07

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

Particulate concentration is equal to a particulate emmision factor of 1.1E+9 m^3/kg

m3/day = cubic meters per day

mg/m3 = milligrams per cubic meter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

CANCER RISKS VIA DERMAL CONTACT WITH SOIL
RECREATIONAL SCENARIO - ADULT

INPUT								
	Surface Area (SA)	Adherence Factor (AF)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(cm2/day)	(mg/cm2)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	5,700	0.27	20	24	52	70	1E-06	365

INPUT					OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Absorption Factor (ABS)	Toxicity Values		Average Exposure	
	Site Concentrations (mg/kg)	(percent)		Slope Factor (mg/kg-day)-1	ADD (mg/kg-day)	Cancer Risk (CR)
RECREATIONAL SCENARIO						
Arsenic	1413.0	0.03		1.5	2.4E-05	3.5E-05
RECREATIONAL SCENARIO CR SUBTOTAL						3.5E-05

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

cm2/day = square centimeters per day

mg/cm2 = milligrams per square centimeter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

RECREATIONAL SCENARIO - ADULT
PATHWAY-SPECIFIC AND CHEMICAL-SPECIFIC CANCER RISK

INPUT				OUTPUT
	Cancer Risk - Recreational Scenario			***Chemical-Specific***
	Ingestion of Soil	Inhalation of Dust	Dermal Contact with Soil	***Cancer Risk***
Chemicals of Potential Concern	Exposure Risk	Exposure Risk	Exposure Risk	Total Exposure Risk
Arsenic	7.7E-05	1.2E-07	3.5E-05	1.1E-04
Pathway-Specific Cancer Risk:	7.7E-05	1.2E-07	3.5E-05	1.1E-04
				Recreational Scenario Cummulative Cancer Risk

HAZARD QUOTIENTS VIA INGESTION OF SOIL
RECREATIONAL SCENARIO - ADULT

INPUT							
	Ingestion Rate (ING)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(mg/day)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	100	20	24	52	24	1E-06	365

INPUT			OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS) Site Concentrations (mg/kg)	Toxicity Values Reference Dose (mg/kg-day)	Average Exposure ADD (mg/kg-day)	Hazard Quotient (HQ)
RECREATIONAL SCENARIO				
Arsenic	1413.0	0.0003	1.5E-04	5.0E-01
RECREATIONAL SCENARIO HQ SUBTOTAL				5.0E-01

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

mg/day = milligrams per day

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

HAZARD QUOTIENTS VIA INHALATION OF DUST
RECREATIONAL SCENARIO - ADULT

INPUT								
	Inhalation Rate (INH)	Particulate Concentration (PC)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(m3/day)	(mg/m3)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	20	0.00076	20	24	52	24	1E-06	365

INPUT			OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values	Average Exposure	
	Site Concentrations (mg/kg)	Reference Dose (mg/kg-day)	ADD (mg/kg-day)	Hazard Quotient (HQ)
RECREATIONAL SCENARIO				
Arsenic	1413.0	NA	2.3E-08	NA
RECREATIONAL SCENARIO HQ SUBTOTAL				NA

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

m3/day = cubic meters per day

mg/m3 = milligrams per cubic meter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

HAZARD QUOTIENTS VIA DERMAL CONTACT WITH SOIL
RECREATIONAL SCENARIO - ADULT

INPUT								
	Surface Area (SA)	Adherence Factor (AF)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(cm2/day)	(mg/cm2)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	5,700	0.27	20	24	52	24	1E-06	365

INPUT				OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Absorption Factor (ABS)	Toxicity Values	Average Exposure	
	Site Concentrations (mg/kg)	(percent)	Reference Dose (mg/kg-day)	ADD (mg/kg-day)	Hazard Quotient (HQ)
RECREATIONAL SCENARIO					
Arsenic	1413.0	0.03	0.0003	6.9E-05	2.3E-01
RECREATIONAL SCENARIO HQ SUBTOTAL					2.3E-01

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

cm2/day = square centimeters per day
mg/cm2 = milligrams per square centimeter
kg = kilograms
kg/mg = kilograms per milligram
mg/kg = milligrams per kilogram
mg/kg-day = milligrams per kilogram per day

RECREATIONAL SCENARIO - ADULT
PATHWAY-SPECIFIC AND CHEMICAL-SPECIFIC HAZARD INDICES

INPUT				OUTPUT
	Hazard Quotient - Recreational Scenario			***Chemical-Specific Hazard Index***
	Ingestion of Soil	Inhalation of Dust	Dermal Contact with Soil	
Chemicals of Potential Concern	Exposure Risk	Exposure Risk	Exposure Risk	Total Exposure Risk
Arsenic	5.0E-01	0.0E+00	2.3E-01	7.3E-01
Pathway-Specific Hazard Index:	5.0E-01	0.0E+00	2.3E-01	7.3E-01
				Recreational Scenario Cummulative Hazard Index

CANCER RISKS VIA INGESTION OF SOIL
RECREATIONAL SCENARIO - CHILD

INPUT							
	Ingestion Rate (ING)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(mg/day)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	133	20	18	35	70	1E-06	365

INPUT				OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values		Average Exposure	
	Site Concentrations (mg/kg)		Slope Factor (mg/kg-day)-1	ADD (mg/kg-day)	Cancer Risk (CR)
RECREATIONAL SCENARIO					
Arsenic	1413.0		1.5	7.6E-05	1.1E-04
RECREATIONAL SCENARIO CR SUBTOTAL					1.1E-04

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

mg/day = milligrams per day

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

CANCER RISKS VIA INHALATION OF DUST
RECREATIONAL SCENARIO - CHILD

INPUT								
Recreational Scenario	Inhalation Rate (INH) (m3/day)	Particulate Concentration (PC) (mg/m3)	Exposure Frequency (EF) (days/year)	Exposure Duration (ED) (years)	Body Weight (BW) (kg)	Averaging Time (AT) (years)	Conversion Factors	
							Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	4.8	0.00076	20	18	35	70	1E-06	365

INPUT				OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values		Average Exposure	
	Site Concentrations (mg/kg)		Slope Factor (mg/kg-day)-1	ADD (mg/kg-day)	Cancer Risk (CR)
RECREATIONAL SCENARIO					
Arsenic	1413.0		15	2.1E-09	3.1E-08
RECREATIONAL SCENARIO CR SUBTOTAL					3.1E-08

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

Particulate concentration is equal to a particulate emmision factor of 1.1E+9 m^3/kg

m3/day = cubic meters per day

mg/m3 = milligrams per cubic meter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

CANCER RISKS VIA DERMAL CONTACT WITH SOIL
RECREATIONAL SCENARIO - CHILD

INPUT								
Recreational Scenario	Surface Area (SA) (cm2/day)	Adherence Factor (AF) (mg/cm2)	Exposure Frequency (EF) (days/year)	Exposure Duration (ED) (years)	Body Weight (BW) (kg)	Averaging Time (AT) (years)	Conversion Factors	
							Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	3,700	0.20	20	18	35	70	1E-06	365

INPUT					OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Absorption Factor (ABS) (percent)	Toxicity Values		Average Exposure	
	Site Concentrations (mg/kg)			Slope Factor (mg/kg-day)-1	ADD (mg/kg-day)	Cancer Risk (CR)
RECREATIONAL SCENARIO						
Arsenic	1413.0	0.03		1.5	1.3E-05	1.9E-05
RECREATIONAL SCENARIO CR SUBTOTAL						1.9E-05

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

cm2/day = square centimeters per day

mg/cm2 = milligrams per square centimeter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

RECREATIONAL SCENARIO - CHILD
PATHWAY-SPECIFIC AND CHEMICAL-SPECIFIC CANCER RISK

INPUT				OUTPUT
	Cancer Risk - Recreational Scenario			***Chemical-Specific Cancer Risk***
	Ingestion of Soil	Inhalation of Dust	Dermal Contact with Soil	
Chemicals of Potential Concern	Exposure Risk	Exposure Risk	Exposure Risk	Total Exposure Risk
Arsenic	1.1E-04	3.1E-08	1.9E-05	1.3E-04
Pathway-Specific Cancer Risk:	1.1E-04	3.1E-08	1.9E-05	1.3E-04
				Recreational Scenario Cummulative Cancer Risk

HAZARD QUOTIENTS VIA INGESTION OF SOIL
RECREATIONAL SCENARIO - CHILD

INPUT							
	Ingestion Rate (ING)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(mg/day)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	133	20	6	15	6	1E-06	365

INPUT			OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values	Average Exposure	
	Site Concentrations (mg/kg)	Reference Dose (mg/kg-day)	ADD (mg/kg-day)	Hazard Quotient (HQ)
RECREATIONAL SCENARIO				
Arsenic	1413.0	0.0003	6.9E-04	2.3E+00
RECREATIONAL SCENARIO HQ SUBTOTAL				2.3E+00

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

mg/day = milligrams per day

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

HAZARD QUOTIENTS VIA INHALATION OF DUST
RECREATIONAL SCENARIO - CHILD

INPUT								
Recreational Scenario	Inhalation Rate (INH) (m3/day)	Particulate Concentration (PC) (mg/m3)	Exposure Frequency (EF) (days/year)	Exposure Duration (ED) (years)	Body Weight (BW) (kg)	Averaging Time (AT) (years)	Conversion Factors	
							Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	4.8	0.00076	20	6	15	6	1E-06	365

INPUT			OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS)	Toxicity Values	Average Exposure	
	Site Concentrations (mg/kg)	Reference Dose (mg/kg-day)	ADD (mg/kg-day)	Hazard Quotient (HQ)
RECREATIONAL SCENARIO				
Arsenic	1413.0	NA	1.9E-08	NA
RECREATIONAL SCENARIO HQ SUBTOTAL				NA

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

m3/day = cubic meters per day

mg/m3 = milligrams per cubic meter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

HAZARD QUOTIENTS VIA DERMAL CONTACT WITH SOIL
RECREATIONAL SCENARIO - CHILD

INPUT								
	Surface Area (SA)	Adherence Factor (AF)	Exposure Frequency (EF)	Exposure Duration (ED)	Body Weight (BW)	Averaging Time (AT)	Conversion Factors	
Recreational Scenario	(cm2/day)	(mg/cm2)	(days/year)	(years)	(kg)	(years)	Mass (MCF) (kg/mg)	Time (TCF) (days/year)
Average Exposure	2,800	0.20	20	6	15	6	1E-06	365

INPUT				OUTPUT	
Chemicals of Potential Concern (COPCs)	Concentrations (CS) Site Concentrations (mg/kg)	Absorption Factor (ABS) (percent)	Toxicity Values Reference Dose (mg/kg-day)	Average Exposure ADD (mg/kg-day)	Average Exposure Hazard Quotient (HQ)
RECREATIONAL SCENARIO					
Arsenic	1413.0	0.03	0.0003	8.7E-05	2.9E-01
RECREATIONAL SCENARIO HQ SUBTOTAL					2.9E-01

Notes:

Enter "NA" for CS or toxicity values if they are not available

NA = not available

Average CS includes one-half the sample quantitation limit for COPCs that are undetected

cm2/day = square centimeters per day

mg/cm2 = milligrams per square centimeter

kg = kilograms

kg/mg = kilograms per milligram

mg/kg = milligrams per kilogram

mg/kg-day = milligrams per kilogram per day

RECREATIONAL SCENARIO - CHILD
PATHWAY-SPECIFIC AND CHEMICAL-SPECIFIC HAZARD INDICES

INPUT				OUTPUT
	Hazard Quotient - Recreational Scenario			***Chemical-Specific Hazard Index***
	Ingestion of Soil	Inhalation of Dust	Dermal Contact with Soil	
Chemicals of Potential Concern	Exposure Risk	Exposure Risk	Exposure Risk	Total Exposure Risk
Arsenic	2.3E+00	0.0E+00	2.9E-01	2.6E+00
Pathway-Specific Hazard Index:	2.3E+00	0.0E+00	2.9E-01	2.6E+00
				Recreational Scenario Cummulative Hazard Index

ECOLOGICAL RISK ASSESSMENT SPREADSHEET FOR ABANDONED MINE SITES

PAGE 1 - SITE SPECIFIC INFORMATION

SITE NAME: **Spring Meadow Lake Site**

	Aquatic Life Maximum Surface Water Conc. ug/L	Assoc. Surface Water Hardness* mg/L	Maximum Sediment Conc. mg/Kg	Deer Ingestion Water Conc. ug/L	Deer Ingestion Phytotoxicity Surface Conc. mg/Kg	Contaminant of Concern ?
Arsenic	32.00	102	110	32	373	Y
Cadmium	0.00	400	0	0.00	0	N
Chromium III	0.0	400	0	0.0	0	N
Copper	0.0	400	0	0.0	0	N
Iron	0	400	0	0	0	N
Lead	3.0	102	319	3.0	519	Y
Mercury	0.00	400	0	0.00	0	N
Nickel	0.0	400	0	0.0	0	N
Silver	0.00	400	0	0.00	0	N
Zinc	10.0	102	619	10.0	1087	y

Note: Minimum hardness=25 mg/L; Maximum=400 mg/L
nhd = not hardness dependent CoCs

All site specific data are entered on page 1; pages 2 through 5 are lookup tables and page 6 presents the resultant EQs.

Enter media concentrations for the site, either areal averages or site maximum concentrations. If a contaminant does not meet the criteria for "contaminant of concern", enter 0 as the concentration or leave it blank (don't leave hardness blank). These criteria are listed below:

1) contaminants associated with and present at the site;
2) contaminants with concentrations significantly above background (generally 3 times higher);
3) contaminants with at least 20% of the measured concentrations above the detection limit; and,
4) contaminants with acceptable QA/QC results applied to the data.

Column B are surface water concentrations for comparison to aquatic life standards. Enter the maximum concentration measured in "real" surface water at the site (i.e. not adit discharges or intermittent water) that aquatic life might live in.

Column C are hardness measurements for the corresponding surface water concentration in column B in mg/L. Note that the minimum hardness for AWQC calculation is 25 mg/L and the maximum is 400 mg/L. Don't leave blank.

Column D are the maximum sediment concentrations measured at the site in "real" surface water (not adit discharges or intermittent drainages) for aquatic life impacts.

Column E are surface water concentrations that deer might drink at the site. This includes adit discharges, intermittent drainages, and ponded water, as long as it is accessible by deer.

Column F are surface waste concentrations for both the deer ingestion (salt) scenario and the phytotoxicity scenario. Enter the mean surface concentration of the highest concentration source at the site (generally tailings).

ECOLOGICAL RISK ASSESSMENT SPREADSHEET FOR ABANDONED MINE SITES

PAGE 2 - AQUATIC LIFE CRITERIA EQ

SITE NAME: **Spring Meadow Lake Site**

	Acute Criteria ug/L	Chronic Criteria ug/L	Acute AWQC EQ	Chronic AWQC EQ
Arsenic	360	190	0.0889	0.1684
Cadmium	8.7	0.8	0.0000	0.0000
Chromium III	5612	268	0.0000	0.0000
Copper	65.4	38.7	0.0000	0.0000
Iron		1000	0.0000	0.0000
Lead	83.7	3.3	0.0358	0.9195
Mercury	2.4	0.012	0.0000	0.0000
Nickel	4582	509	0.0000	0.0000
Silver	44.0		0.0000	0.0000
Zinc	119	108	0.0840	0.0928
TOTAL			0.2088	1.1806

This page calculates AWQC for the hardness values supplied on page 1, column C. Both chronic and acute are calculated in the table; however, the chronic values are for reference only. Chronic criteria are not applicable unless surface water has been sampled over the entire range of hydrologic conditions at the site, and a statistically significant number of samples at each station are averaged to determine the chronic concentrations over time.

ECOLOGICAL RISK ASSESSMENT SPREADSHEET FOR ABANDONED MINE SITES

PAGE 3 - SEDIMENT QUALITY CRITERIA EQ

SITE NAME: **Spring Meadow Lake Site**

	SQC Effect Range-Medium* mg/Kg	Sediment EQ
Arsenic	85	1.2941
Cadmium	9	0.0000
Chromium III	145	0.0000
Copper	390	0.0000
Lead	110	2.9000
Nickel	50	0.0000
Zinc	270	2.2926
TOTAL		6.4867

* from Long and Morgan, 1991

ECOLOGICAL RISK ASSESSMENT SPREADSHEET FOR ABANDONED MINE SITES

PAGE 4 - DEER INGESTION EQ

SITE NAME: **Spring Meadow Lake Site**

	Deer Intake Dose Est. Soil + water mg/Kg-day	Deer Ingestion EQ	
Arsenic	0.0106	0.0017	Toxicological effects from ATSDR, 1991a
Cadmium	0.0000	0.0000	Toxicological effects from ATSDR, 1991b
Copper	0.0000	0.0000	Toxicological effects from NAS, 1980
Lead	0.0087	1.7387	Toxicological effects from ATSDR, 1991c
Zinc	0.0188	0.0000	Toxicological effects from Maita et al, 1981
TOTAL		1.7404	

ECOLOGICAL RISK ASSESSMENT SPREADSHEET FOR ABANDONED MINE SITES

PAGE 5 - PHYTOTOXICITY EQ

SITE NAME: **Spring Meadow Lake Site**

	Phytotoxic Soil Conc.* mg/Kg	Phytotoxicity EQ
Arsenic	50	7.4600
Cadmium	8	0.0000
Copper	125	0.0000
Lead	400	1.2975
Zinc	400	2.7175
TOTAL		11.4750

*Upper end of range, from Kabata-Pendias and Pendias, 1989

ECOLOGICAL RISK ASSESSMENT SPREADSHEET FOR ABANDONED MINE SITES

PAGE 6 - COMBINATION OF ECOLOGIC IMPACT QUOTIENTS (EQs)

SITE NAME: **Spring Meadow Lake Site**

	Aquatic Life-Surface Water EQ (Acute)	Aquatic Life-Sediment EQ	Deer Ingestion EQ	Plant Phytotoxicity EQ	Total by CoC
Arsenic	0.0889	1.2941	0.0017	7.4600	8.8447
Cadmium	0.0000	0.0000	0.0000	0.0000	0.0000
Chromium III	0.0000	0.0000			0.0000
Copper	0.0000	0.0000	0.0000	0.0000	0.0000
Iron	0.0000				0.0000
Lead	0.0358	2.9000	1.7387	1.2975	5.9720
Mercury	0.0000				0.0000
Nickel	0.0000	0.0000			0.0000
Silver	0.0000				0.0000
Zinc	0.0840	2.2926	0.0000	2.7175	5.0942
TOTAL	0.2088	6.4867	1.7404	11.4750	19.9108